VALUE CHAIN/ MARKET ANALYSIS OF THE OFF-SEASON VEGETABLE SUB-SECTOR IN NEPAL

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Nepal Economic Agriculture, and Trade Activityð Value Chain/ Market Analysis of the Off-Season Vegetable Sub-Sector in Nepal
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ACRONYMS

AEC	Agro-Enterprise Center
ANSAB	Asia Network for Sustainable Agriculture and Bioresources
APP	Agriculture Perspective Plan
ASC	Agriculture Service Centers
BMOs	Business Membership Organizations
CADP	Commercial Agriculture Development Project
CCI	Chamber of Commerce and Industry
CBS	Central Bureau of Statistics
CBO	Community Based Organization
CEAPRED	Center for Environment and Agriculture Policy Research, Extension and Development
DADO	District Agricultural Development Office
DDC	District Development Committee
DOA	Department of Agriculture
FFS	Farmers Field School
FGD	Focus Group Discussion
FNCCI	Federation of Nepalese Chamber of Commerce and Industry
FORWARD	Forum of Rural Welfare and Agriculture Reconstruction for Development
GDP	Gross Domestic Products
GO	Government Organization
ha	Hectare
HVAP	High Value Agriculture Project
HVC	High Value Crop
IPM	Integrated Pest Management
JTA	Junior Technical Assistant
kg	Kilogram
MDD	Marketing Developing Directorate
MEDEP	Micro Enterprise Development Program
MOAC	Ministry of Agriculture and Cooperatives
MPC	Marketing and Planning Committee
MASL	Meters above the sea level
MT	Metric Tons
NARC	Nepal Agricultural Research Council
NARDF	National Agriculture Research and Development Fund
NEAT	Nepal Economic, Agriculture, and Trade Activity
NGO	Non Governmental Organization
PACT	Project for Agricultural Commercialization and Trade
PPD	Plant Protection Directorate
TEPC	Trade and Export Promotion Centre
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
VDD	Vegetable Development Directorate

EXECUTIVE SUMMARY

The Nepal Economic, Agriculture, and Trade (NEAT) Activity is a USAID funded project intended to promote economic growth, reduce poverty, and improve lives in Nepal. Under its component 2- encouraging competitiveness and exports in selected agricultural and non agricultural commodities or services, the Asia Network for Sustainable Agriculture and Bioresources (ANSAB), conducted the value chain/market study of the off-season vegetables subsector in Nepal.

The main objective of the study was to analyze the present value chain/market status of off-season vegetables and identify strategies to enhance the competitiveness of the sector with the private sector playing a prominent role. The study team examined information obtained from key stakeholders and from focus group discussions using a standard checklist. The findings of the study revealed that the off-season vegetable market is becoming an attractive enterprise in Nepal. However, the production trend has not progressed as expected. More than 80 percent of onion demand is fulfilled by external sources, mainly India, while more than 75 percent of the demand for other off-season vegetables like cauliflower, cabbage, and cucumber is fulfilled by domestic product.

The findings of the study reveal that off-season vegetable production and marketing is very popular among farmers and marketers. Farmers are making a considerable income from off-season vegetable crops, and it is becoming a very attractive enterprise. This enterprise has been commercialized in areas with good road access for transportation. The study found that post-harvest loss of off-season vegetable was 25-50 percent. The higher post-harvest losses were due to improper handling, packaging, low-level technology, and poor facilities at collection centers. These post-harvest losses indicate great potential for increasing farmers' incomes and improving the rural economy, as well as significant potential for import substitution of vegetables. Similarly, the market prospectus of off-season vegetables is very good, both within and outside the country, especially in Bangladesh and the northern border side markets of India, including Siliguri, Muzafarpur, Patna, Gorakhpur, Lucknow, Bareli, Pilibhit, and Delhi. Nepalôs off-season products could be especially competitive in the hilly Indian markets.

The major constraints of this sector are: a) unavailability of quality planting materials, b) lack of knowledge among the producers of the proper usage of fertilizers and pesticides, as well as poor soil fertility management, c) lack of irrigation facilities, d) labor shortage, e) post-harvest loss due the perishable nature of vegetables, f) limited access to reliable market information, g) unorganized market center, h) limited collection centers, and i) lack of proper packaging and transportation facilities.

Nevertheless, this subsector has many opportunities as well, such as a) availability of seeds, fertilizers, and other inputs in major markets, b) availability of service providers, c) climatic suitability of hilly region, d) increased demands with attractive price, and e) favorable government policy.

After a thorough analysis, short-term and long-term intervention strategies are identified for increasing the competitiveness of this subsector. Short-term interventions include a) introduction of species-wise technological guidelines for off-season vegetable production, b) introduction of poly-house technology, c) promotion of micro-irrigation technology, d) capacity building of the producers through training on production, packaging, storing, and

post-harvest management, e) promotion of grading and collection centers, f) establishment of an off-season vegetable call center, g) provision of crop insurance, and h) support for institutional development cooperatives. The long-term interventions include a) development of off-season vegetable blocks, b) verification/demonstration of different botanical pesticides, c) establishment of cold storage, d) development of an agriculture road, e) support for pesticide residue analysis, f) ensuring government support for export promotion, and g) support for the development of hybrid varieties.

Therefore, encouragement and support toward solving the aforementioned challenges would contribute to the establishment of thriving off-season vegetable crop market. This would reduce foreign import and improve the market competitiveness of Nepalese products, thereby contributing to the national economy.

1. INTRODUCTION

1.1 Background

The NEAT project, a USAID funded contract, is implemented by Chemonics International Inc. The program is designed to promote economic growth, reduce poverty, and improve livelihoods in Nepal. Under its component 2- encouraging competitiveness and exports in select agricultural and non agricultural commodities or services ï the NEAT project supports the subsectors of lentil, off-season vegetables, ginger and orthodox tea, which have been identified for intervention under the competitiveness component. In this regard, Asia Network for Sustainable Agriculture and Bioresources (ANSAB)ð in the partnership of USAID/NEAT Activityð conducted the value chain/market study of the four select agricultural commodities of Nepal.

ANSAB is an independent, nonprofit, civil society organization working in South Asia since 1992. ANSAB is committed to biodiversity, conservation, and economic development through community-based enterprise oriented solutions. ANSAB is the pioneer in developing and applying new approaches to promote natural products-based enterprises and value chain interventions in Nepal. With its exemplary track record, competent team, and wide networks, ANSAB has designed and successfully completed several related projects, including value chain study of commercially important products, with tangible results on the ground. It has also provided different expert services to the stakeholders working in Nepal and other neighboring countries.

Agriculture in Nepal has long been based on subsistence farming, particularly in the hilly regions where locals derive their living from fragmented plots of land cultivated in difficult conditions. The economic well being of Nepal is very closely bound to its natural resources ï arable land, water, and forest areas. Although only comprising some 21 percent of land area, agricultural land is the major determinant of economic activities and the nationôs socio-political identity; it provides employment opportunities to 66 percent of the total population and contributes roughly 36 percent to GDP (www.moac.gov.np). Farming system remain primarily subsistence-oriented, and only a small portion of farms use modern production units. Nepalese agricultural growth is constrained by poor infrastructures, weak institutions, and inadequate technical support for commercialization and supply chain development. In general, the prevailing weak agricultural growth is not sufficient to boost overall per capita income enabling economic transformation in the country.

Among the commercially important agricultural commodities of Nepal, off-season vegetables (cabbage, cauliflower, cucumber, tomato, onion, and chili) have been identified as some of the most promising value chains for increasing incomes of smallholder farmers through improved production and marketing. Given the priority accorded to the off-season vegetable market and its potential to mitigate rural poverty, ANSAB conducted the value chain/market study of this subsector of Nepal.

1.2 Objective

The overall objective of this study was to carry out in-depth value chain/market assessments of off-season vegetables and provide insights into the project for intervention designing and program implementation.

1.3 Scope of the Study

The scope of this study is as follows:

- Provide a short description of the off-season vegetables value chain based upon existing reports (value chain analyses with focus in competitiveness and impact) with a clear value chain map;
- Identify of all actors along the value chain: their numbers, roles, and existing relationship;
- Supply a list of lead firms/exporters/traders, with contact details, and to the extent possible, an estimate of their size and/or importance (i.e. percent of market, major commodity supply areas); estimate import substitution potential for NEAT;
- Identify off-season vegetable pocket areas in NEAT districts, based on interviews with wholesalers and trader; provide direct linkages to these contacts;
- Provide list of Indian importers/buyers with contact details;
- Conduct in-depth market study giving reliable monetary estimates of the full value chain: production, imports/exports, value addition, value chain governance, etc.;
- Perform interviews with major lead firms/exporters identifying key opportunities and constraints;
- Visit Indian border markets to meet with importers;
- Conduct private sector dialogue meetings, bringing together key actors along the value chains, to discuss key opportunities and constraints and possible win-win activities for NEAT;
- Assess willingness of actors (e.g. traders, firms) to work together to enhance their competitiveness; and
- Identify main strategies and their implications for down- and upstream actors, including their costs-benefits.

1.4 Study Approach and Methodology

The study was based on the value chain approach, focusing on market competitiveness and export. The methodology of this study included market visits, interactions with stakeholders working in the sector of the off-season vegetables in Nepal (cauliflower, cabbage, onion, cucumber, tomato, and chili), and interactions with traders, processors, and exporters. Three types of checklists were developed and used for the discussions with traders, focus group discussions (FGD) at pocket levels, and concerned institutions. One component of the study included an analysis of the enabling environment, which would be necessary to foster the business.

The study was carried with consultation and in close coordination with NEAT staff, government agencies such as DoA, DADO, and NARC, non-government organizations (NGOs), Business Membership Organizations (BMOs) such as AEC, FNCCI, and DCCI, and cooperatives. Both qualitative and quantitative data were used for this study. Qualitative data was collected from interactions with farmers, traders, and related stakeholders, whereas quantitative data was collected from secondary sources.

This study concentrated on three corridors of off-season vegetable production and trade, namely i) Dhankuta/Ilam-Dharan-Biratnagar/Siliguri ii) Palpa ï Butwal/Bhairahawa ï Sunauli, and iii) Salyan/Dailekh ï Nepalgunj/Kohalpur ï Rupaidiya. The information

collected from different sources was triangulated and validated through a private sector dialogue meeting (PSDM) at Butwal and reviewed by experts before finalization. Specifically, the study followed these activities in sequence:

- Development of methodology, including checklists and travel plan;
- Consultation with NEAT team and finalization of methodology;
- Review of existing reports and publications ï VDD, AEC, USAID;
- Consultation meeting with Kathmandu-based organizations;
- Visits to production districts ï Ilam, Dhankuta, Palpa, Salyan, Dailekh, Surkhet, Banke ï and interactions with the key informants - DADO, CCI;
- Visits to markets such as Kathmandu, Dharan, Kakarbhitta, Siliguri, Butwal, Bhairahawa, and Nepalgunj, and interactions with traders;
- Conduct private sector dialogue meetings at Butwal;
- Prepare and share draft report; and finally
- Review of the report and the final submission.

1.5 Limitations of the Study

The off-season vegetable production area in Nepal is scattered from east to west throughout the country, so it is difficult to cover all of the pockets in a short period of time. Owing to the current production trend and future potential, this study purposively selected the eastern, western, and mid-western development regions. Dhankuta, Palpa, Salyan, Surkhet, Dailekh, and Banke were selected as the sample districts for the collection of information from farmers, which may not adequately capture the nationwide scenario. Information on marketing was gathered from sample markets of Nepal and some boarder cities of India.

2. INDUSTRY ANALYSIS

2.1 Vegetable Production Situation in Nepal

Horticultural crops are the major sector of Nepalese agriculture. Horticulture contributes about 14 percent to the total agricultural gross domestic products (AGDP) (Thapa, 1998). The share of horticulture to the AGDP has increased in recent years. By realizing the importance and role of horticulture, the Agriculture Perspective Plan (APP) has targeted the growth rate of horticulture GDP to 5.5 percent per annum by 2014/2015 and growth rate of vegetable GDP in particular to 5.42 percent per annum. Among the horticultural crop, the vegetable sector is has the most significant contribution to total horticultural GDP. At present, more than two hundred vegetable species are grown in the different climatic zones of Nepal, out of which fifty species and their varieties are grown on the commercial basis (Shrestha *et al.*, 2004). In 2009/2010, production of vegetable was 3,003,821 MT from an area of 235,098 ha at an average yield of 12.77 MT/ha (MOAC, 2010).

According to standards set forth by dieticians and nutritionists, the minimum per capita per day requirement of vegetables is 300 gm. The vegetable intake by Nepali people is very low compared to this standard, with a deficiency of 60 percent in relation to vegetable production (Gautam and Bhattarai, 2006). Growing demand of vegetables is increasing day by day due to a major shift by people living in the country to healthy food. Vegetables have become an integral part of a balanced diet, and play a vital role in providing nutritional security. A result has been an improvement in the financial situation among a majority of small-scale farmers.

A wide range of agro-ecological variation creates a comparative advantage for the production of different vegetable crops. The production of off-season vegetables, utilizing these ecological niches, could be extremely beneficial in the context of nutrition, employment, and income generation. The Nepalese government is also emphasizing the production of off-season vegetables in the hills of Nepal as an important cash crop that could enhance the income level of farmers and thus help reduce the incidence of poverty (APP, 1995). Tomato, cauliflower, cabbage, cucumber, onion and chili are the major off-season vegetables of Nepal. Among them, the cultivation of tomato, cauliflower, and cabbage are the most popular and the most profitable (NARC, 2006). In terms of production, cauliflower is the most highly cultivated vegetable at 404,580 MT, followed by tomato (317,657 MT) and cabbage (302,067 MT) (Prasain, 2011). Due to the higher return per unit of land, the area, production, and productivity of vegetables is increasing day by day. Off-season vegetable farming has played a vital role contributing to the rise in economic status of the farmers of the hills, in part by providing regular employment and income to the marginal farmers and his/her family members throughout the year (Panta, 2001). Although the Terai region produces and sells more vegetables, vegetables grown in the hilly region have greater value; these vegetables are produced during the rainy season when prices are higher (Prasain, 2011).

From 2001 to 2010, the area and production level of vegetables increased significantly. However, the increase in yield per hectare was incremental by comparison. The area, production, and productivity of study district are shown in Table 1.

Table 1: Area, Production and Yield of Vegetables in Nepal

Year	Area (Ha.)	Production (MT.)	Yield (kg/Ha.)
1999/2000	149,030	1,489,665	9,996
2000/2001	157,162	1,652,979	10,518
2001/2002	161,048	1,738,086	10,792
2002/2003	165,988	1,799,973	10,844
2003/2004	172,586	1,890,100	10,952
2004/2005	180,823	2,065,193	11,421
2005/2006	189,832	2,190,100	11,537
2006/2007	191,922	2,298,689	11,977
2007/2008	208,108	2,538,904	12,200
2008/2009	225,154	2,754,406	12,233
2009/2010	235,098	3,003,821	12,777

Source, MOAC, 2010

2.2 Off-season Vegetable Production in Nepal

Off-season vegetable farming refers to the production of vegetables before or after their normal season of production. This is accomplished by using different agro climatic conditions, adjusting the planting time, selecting and improving the varieties, and/or creating a controlled environment (by making plastic tunnels, polythene houses, permanent glass-houses, etc.).

The winter vegetables of the plains, such as tomato, chili, onion, cabbage, and cauliflower, can be produced during the autumn and rainy season (summer) in the mid-hills of Nepal. Off-season vegetables produced during these periods fetch high prices in the plains due to short supply and high demand. Utilizing the off-season vegetable production technology, some areas in the mid hills have been able to produce vegetables in a scale large enough to enable export in Indian markets. Similarly, the dissemination of rainy season vegetable production technology in the mid-hills has contributed significantly to the rise in economic status of many farmers, by providing high return and more employment opportunities.

Locations at altitudes varying from 400 to 2,000 meters are considered suitable for off-season vegetable production. According to the Nepal Agricultural Research Council (NARC), off-season production technologies for tomato, onion, cucumber, cabbage, and cauliflower have been developed and recommended to farmers in these regions (Shah *et al.,* 2004). Areas that have benefitted the most are the pocket areas along the roads and in the surroundings of large cities such as Kathmandu and Pokhara, where there the high concentration of business and government activity, as well as tourism, results in high. In addition, many large Terai areas and Indian border cities also have high demand for off-season vegetables. Panchkhal (Kabhre), Tistuing, Palung and Daman (Makwanpur), Ranipauwa (Nuwakot), Basantpur, Hile and Sidhuwa (Dhankuta), Madanpokhara (Palpa) and many pockets along the eas- west highway are important locations where farmers have successfully grown off-season vegetables.

Areas with roads have the greatest potential production area for off-season vegetables. Bajrabarahi/Makwanpur and Chatredeurali/Dhading have the advantage of being located very

close to Kathmandu valley, which has almost one-third of the urban population in Nepal. Both areas have used this advantage in marketing their products, and their off-season vegetable markets are quite successful, particularly capsicum, tomato, and cauliflower. In the far west, the farmer groups of Dadeldhura and Kailali, encouraged by the introduction of vegetables in areas where previously no vegetables were grown, have established good markets in Dhangadhi and Kanchanpur, as well as trade relationships with some traders from the border town of Khatima, India. Likewise, the farmers groups of Ratanangla, Dailekh; Kapurkot, Salyan; and Sindhuwa, Dhankuta, working independently or with some help from institutions, are examples of off-season producers that are expanding each year due to the potential of off-season marketing. Currently, Bangladesh and northern border-side markets of India hold the greatest potential for Nepalôs off-season products.

Over the last decade, the attraction of off-season vegetable production has increased; however, the increase in production has been slow. A long channel of product flow from farmers to consumers has decreased potential income for farmers from product sale. Farmers face problems like fluctuation in demand, fluctuation in price, and high post-harvest losses, all of which make the value chain inefficient.

Though the production season of off-season vegetables varies depending on climatic and topographic conditions, the common season of major off-season vegetables in the hills of Nepal is as follows:

Table 2: Common Off-season Vegetables in the Hills of Nepal

Types of off- season vegetables	Growing season
Cabbage	Year Round
Cauliflower	January- March
Cucumber	April- November
Tomato	Year Round
Radish	January- March
Brinjal	Year Round
Summer Squash	March- May
Carrot	January- March
Swiss Chard	Year Round

Source: AEC, 2006

2.3 Production Situation of Vegetables in the Study Districts

Among the districts included in the study, Ilam, Dhankuta, Palpa, Salyan, Dailekh and Surkhet are the most important in terms of off-season vegetables production. Many production pockets in these districts are either along road heads or 1 to 5 km away from the road heads. Only about 40 percent of the cultivated land in production pockets is irrigated, thereby limiting the cultivating area. The organized wholesale markets in all districts are 40 to 80 km away from the production pockets. In all districts, cabbage, cauliflower, and tomato are the leading off-season vegetables.

Table 3: Area, Production and Productivity of Vegetables in NEAT Districts (2009/10)

Districts	Category	Cauliflower	Cabbage	Tomato	Chili	Onion	Cucumber	Total
Illam	Area (Ha)	385	725	97		100	66	3,202
	Prod. (MT)	6,523	11,925	1,234		1,400	726	44,820
	Yield (MT/Ha)	17	16	13		14	11	14
Dhankuta	Area (Ha)	330	844	345	32	25	37	3,427
	Prod. (MT)	6,000	16,670	6,850	170	388	480	52,198
	Yield (MT/Ha)	18	20	20	5	16	13	15
Palpa	Area (Ha)	410	330	120	40	35	75	2,019
	Prod. (MT)	6,109	5,214	2,250	352	448	900	26,247
	Yield (MT/Ha)	15	16	19	9	13	12	13
Salyan	Area (Ha)	113	105	120	51	145	105	2,035
	Prod. (MT)	1,300	1,526	1,620	639	653	1,386	22,428
	Yield (MT/Ha)	12	15	14	13	5	13	11
Dailekh	Area (Ha)	298	265	120	7	96	180	3,164
	Prod. (MT)	4,470	4,108	1,980	35	1,272	1,980	31,318
	Yield (MT/Ha)	15	16	17	5	13	11	10
Surkhet	Area (Ha)	150	120	155	95	100	185	2,495
	Prod. (MT)	2,562	1,908	3,536	605	2,142	2,074	32,696
	Yield (MT/Ha)	17	16	23	6	21	11	13
Banke	Area (Ha)	450	340	552	280	640	10	6,550
	Prod. (MT)	6,750	4,420	7,225	2,240	5,760	90	69,446
	Yield (MT/Ha)	15	13	13	8	9	9	11
Bardiya	Area (Ha)	625	510	265	125	164	297	3,792
	Prod. (MT)	15,625	13,515	7,553	816	1,374	6,237	75,010
	Yield (MT/Ha)	25	27	29	7	8	21	20

Source: MOAC, 2010

The information regarding production and yield of different vegetables in study districts are described as below:

Dhankuta

In Dhankuta, a large number of farmers produce off-season vegetables on commercial scale. Some of the important vegetables in this district are cauliflower, cabbage, tomato, onion, radish, bitter gourd, brinjal, peas, cucumber, bottle gourd, beans, green chili, and sponge gourd. After fulfilling the internal demand of vegetables in the district, some of the vegetables are traded to Dharan and Biratnagar markets. The commercial production of off-season vegetables has intensified in select pockets where improved varieties of vegetable seed and road networks have played a major role.

The major off-season vegetables cultivated in Dhankuta district are tomato (which has the maximum yield), cauliflower, cabbage, cucumber, and chili. Cucumber, though it has the lowest yield, has the highest average price. Cabbage has the lowest average price. With the same cost of cultivation, the gross income of tomato is more than cabbage and chili. Furthermore, with the same cost of cultivation, the gross income for cucumber is more than cauliflower. Most of the farmers use their family labor for cultivation and harvesting and use farm yard manure and compost along with chemical fertilizers during cultivation.

Salyan
In Salyan district, 22,428 metric tons (MT) of vegetables are produced in the commercial production areas. These vegetables are produced to meet the demand of Nepalgunj, Dang, and Kohalpu,r as well as for export to the Indian border cities of Rupaidiya and Nanpara. Important off-season vegetables are tomato, green chili, cucumber, and cabbage. Some spices such as onion, garlic, dried chili, and turmeric are also produced. With the help of improved varieties of vegetable seed, the commercial production of fresh vegetables has intensified in selected pockets near roads and collection centers. Because integrated and mixed farming systems prevail in this area, most farmers to record all fixed costs. Therefore, variable cost items were included in the analysis of the cost of production.

The major off-season vegetables cultivated in Salyan district are tomato, cauliflower, cabbage, cucumber, and chili. The tomato has the maximum yield whereas the cucumber has the minimum yield. The average price of the chili is highest among the other vegetables with the lowest price being for cauliflower. With the same cost of cultivation, the gross income of chili is more than cucumber.

Surkhet
In Surkhet, the commercial production of fresh vegetables has intensified in selected pockets near roads and market centers. Improved and hybrid varieties of vegetable seed have played a major role in this increase. The major off-season vegetables cultivated in Surkhet are tomato, cauliflower, cabbage, cucumber, and chili. The tomato has the maximum yield whereas cucumber has the minimum yield. The average price of the chili is highest among the other vegetables with the lowest price being for cabbage.

Palpa
In Palpa, four commercial pockets have developed; in Dobhan, Madan Pokhara, Aaryabhanjyang and Bhairabsthan, many farms are either along the roadways or are 1 to 3 km from the road heads. A total of 26,247 MT of vegetables are produced in commercial production areas. In the farms without road connections, farmers face the difficulty of finding porters for transporting their produce. The major off-season vegetables cultivated in Palpa are tomato, cauliflower, cabbage, cucumber, and chili. The tomato has the maximum yield whereas the cucumber has the minimum yield. The average price of the cauliflower is highest among the other vegetables with the lowest price being for chili. With the same cost of cultivation, the gross income of cauliflower is more than cabbage.

2.4 Management Practices of Off-season Vegetables in Nepal

Cropping systems: Three types of cropping systems prevail in the hills of Nepal: maize-based, rice-based, and vegetable-based. The vegetable-based cropping system is important for farmers in the study area because vegetable farming provides income. Major crops grown in the monsoon season include the following: paddy in the flat terraces, maize in un-irrigated areas and other land where water is not lodged, and off-season vegetables such as tomato, cauliflower, and cabbage. In the winter, farmers produce the seasonal crops of potato, leafy vegetables, onions, garlic, and wheat. Farmers produce cucumber in the early spring, followed by off-season cucurbits such as bitter gourd, sponge gourd, green pumpkins, and eggplant for export to larger cities.

Planting materials: Seed is the primary planting material for the majority of the vegetable crops. In the initial years of vegetable cultivation, farmers used seeds of local varieties

produced in their own fields. In 1998, farmers started growing other improved and hybrid varieties from seed purchased from outside. Today, farmers use high-yielding hybrids varieties provided by agro vets from multinational companies based in India.

Soil preparation: Human labor is used for soil preparation throughout the study area. Land is prepared by pulverizing the soil to allow easier root penetration, to facilitate mixing manure and fertilizer, and to help destroy harmful insects and pests. Crops such as garlic, onion, and coriander are sown on sunken beds, and crops such as cauliflower, cabbage, radish, tomato, chili, and cucumber are planted on raised beds.

Planting and nursery management: The choice of planting technique is influenced by factors such as the type of vegetable, the schedule for marketing, the desired yield, and the shape, size, or weight of the product. For example, carrot, radish, turnip, coriander, beans, and okra are sown directly. Eggplant, cauliflower, cabbage, chili, cucumber, and tomato are transplanted. Off-season vegetable seeds (such as cucurbits) are grown on poly pot inside plastic tunnels. Nursery seedbeds are generally preferred near the residence or in a safe corner of the main field. The nursery soil is given a fine tilt, and weeds, plant debris, pebbles, chaff, etc., are removed. After preparing raised (in summer) or sunken beds (in late winter), 2-5 kg/m² of decomposed compost is mixed with the nursery soil. Seeds are usually broadcast and covered with a mixture of soil, ash, and compost.

Irrigation: Upland mid-hill farming systems in Nepal are mostly rain fed, which remain fallow during dry seasons due to lack of irrigation water. The shortage of irrigation water, particularly during the pre-monsoon season, was the concern expressed by most farmers.

Soil fertility management: Farmers in the study area depend primarily on organic manure, compost prepared from locally available organic materials, or farmyard manure. Large amounts of both types are applied at the time of land preparation. In addition, farmers also use wood ash, cattle urine, leguminous crops, mulch, and recycled weeds as part of soil fertility maintenance. Once farmers started growing vegetables for commercial sale, use of chemical fertilizers increased. The study found that the majority of the farmers apply 6 kg of Urea; 4.5 kg of DAP and 3.5 kg of Potash per ropani (0.05ha.) of land in addition to the traditional organic matters.

Weeding and other cultural practices: Most weeding is done manually; no herbicide is used. Weeds are used fed to animals or are composted depending upon the distance of the farm from the household, the type of animal raised, and the quantity and type of weeds gathered.

Plant protection: Common pesticides used in the study areas are as follows: Malathion, Rogor, and Novan for insect control; Crynoxil gold, Dithenium 45, Dymethoate 35EC, Hexcolon, and Cerelation for disease control. The practice of using these pesticides was introduced to the farmers by extension workers from the District Agriculture Development Office (DADO).

Harvesting: The amount of labor required for harvesting vegetables is high compared to other food or cash crops. Vegetable harvesting must be done in more than one batch, and cannot be done during early morning hours or during periods of rain. Harvesting is done manually with the use of tools such as sikels, spades, and cutting knifes. Usually bamboo baskets called *Dokos* are used for transporting vegetables to collection centers and markets.

Processing and storage: The processing and storage of vegetables is not an issue, as farmers. Tend to sell their vegetables fresh to consumers or middlemen. This lack of storage facilities has benefited the off-season vegetable market.

Labor availability: Few machines are used in the study area, as most farming is done by family members, augmented by hired labor needed. Community labor assistance (*Parma*) does not exist in vegetable farming; rather, *Parma* is practiced only for cereal crops.

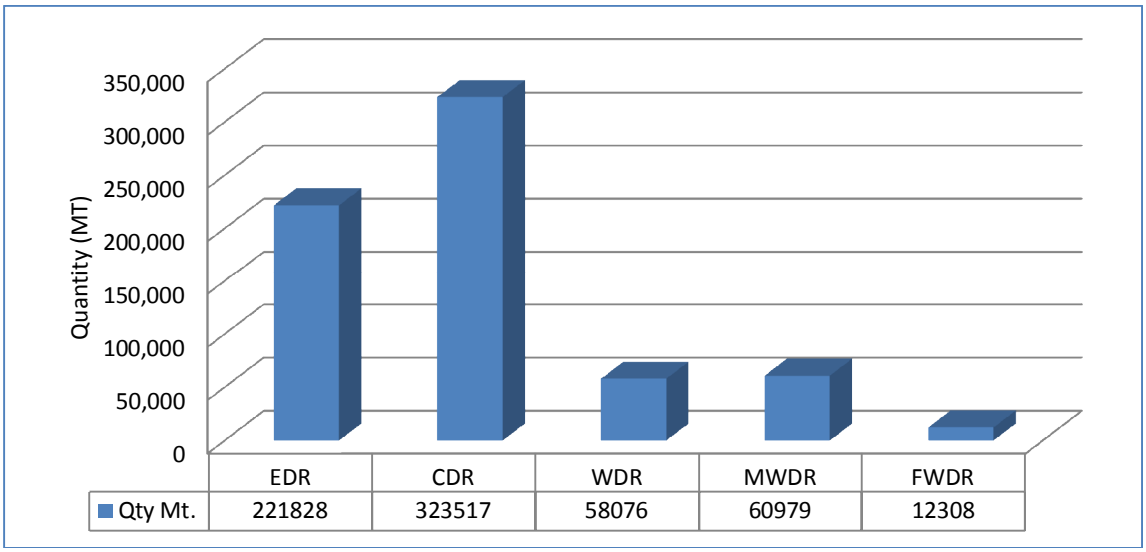
Extension activities: Extension activities are carried out by junior technicians (JTs) and junior technical assistants (JTAs) stationed in the Agriculture Service Centers (ASC). Training, demonstration, mini-kits, integrated pest management (IPM), farmer field schools (FFS), and farmer observation tours are major extension activities carried out by extension agents in study area.

Farmers' attitudes: Given the likelihood of profits from the sale of vegetable crops, farmers were open to new technologies for vegetable farming. Most farmers reported that their positive attitude towards vegetable farming is in response to the availability of markets and seeds, and higher prices in comparison to that of food crops.

2.5 Domestic Markets

In development regions, the trade of vegetables is highest in the central region, followed by the eastern region. The central development region alone transacts 323,517 MT of vegetables, while the transaction in the far western development region where transactions are lowest is 12,308 MT. Vegetable trade by development region is illustrated in Figure 1.

Figure 1: **Vegetable Trade by Development Region**



Source: VDD, 2011

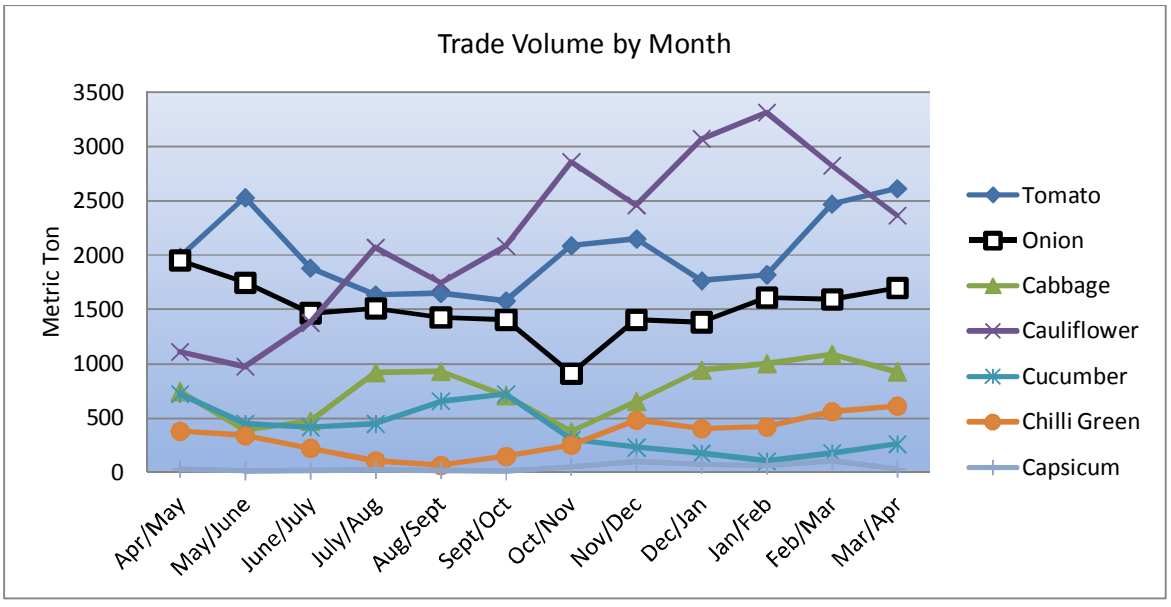
Kalimati Wholesale Market, Kathmandu

The Kalimati Fruits and Vegetable Wholesale Market is the leading terminal wholesale market in Nepal, where retailers, institutional consumers, and other bulk consumers procure their supplies of commodities. The Kalimati Market was established in 1986 by what was the Department of Food and Agriculture Marketing Services under the Ministry of Agriculture, in order to provide some organization to the marketing of agricultural produce, especially fruits and vegetables in Kathmandu valley,

There are 45,243 registered traders in this market. Kathmandu, Lalitpur, Bhaktapur, Dhanding, Nuwakot, Kavrepalachowk and Makawanpur are the major suppliers of off-season vegetables in this market, 296 wholesalers coming from these disctricts.

The trade volume of vegetables fluctuates each month. For cauliflower, May to September is the off-season period, while for tomato the off-season months range from July to October. Similarly for cabbage and onion, the months of October and November are the off-season. The period of December to March is the off-season period for cucumber. Throughout the year, the supply of capsicum is very nominal (Figure 2).

Figure 2: Monthly Trade Volume of the Vegetables in Kalimati Market



Source: Kalimati Fruit and Vegetable Wholesale Market, 2011

Table 4: Annual Trade of Select Vegetables in Kalimati Market (2010/11)

Crops	Total	Nepal		India		Tibet	
	Total (MT)	Volume (MT)	percent	Volume (MT)	percent	Volume (MT)	percent
Tomato- Big	4,029	1,576	39.1	2,453	60.9	0	0
Tomato- Small	20,146	20,060	99.6	86	0.4	0	0
Onion- Dry	17,435	76	0.4	15,733	90.2	1,626	9.33
Onion- Green	696	673	96.7	23	3.3	0	0
Cabbage	9,162	9,036	98.6	126	1.4	0	0
Cauliflower- Local	20,650	20,650	100	0	0.0	0	0
Cauliflower- Terai	5,614	5,503	98.0	111	2.0	0	0
Chili- Green	4,003	1,288	32.2	2,715	67.8	0	0
Capsicum	556	207	37.2	349	62.8	0	0
Cucumber	4,687	4,161	88.8	526	11.2	0	0

Source: Kalimati Fruit and Vegetable Wholesale Market, 2011

For the Kalimati Market, green onion, cabbage, cauliflower, and cucumber are mostly supplied from the various production pockets of Nepal. However, Kalimati Market imports big tomato, dry onion, green chili, and capsicum from India. Onion is imported from China as well.

Dharan wholesale market, Dharan

Dharan is one of the largest and most well-developed wholesale vegetable markets in the eastern region of Nepal. For this market, the vegetables are collected from the eastern districts of Dhankuta, Bhojpur, Sunsari, Terathum, and Sankhuwashawa. Tomato, chili, cabbage, cucumber, and cauliflower are the major vegetables traded in this market. In terms of wholesale prices, September/October is the best season and February/March is the worst. Cucumber, onion, and chili are in better price positions than tomato, cabbage, and cauliflower. Farmers of this region who are able to produce off-season vegetables from May to November would get premium prices.

Nepalgunj wholesale market

Nepalgunj is the major wholesale market of mid-western region. This is the border area of India and is greatly influenced by the inflow of commodities from India. Off-season vegetables especially from Surkhet, Dailekh, and Salyan districts are traded from this market.

Surkhet wholesale market

There is only one small wholesale/retail market in the Birendranagar municipality area, called Babushahi Vegetable Market (Tarkari Bazar). Within the Surkhet valley and near the Surkhet-Nepalgunj highway and other highways (Surkhet-Dailekh and Karnali highway), vegetable marketing is made possible by the connection of pocket areas to the market centers. The District Agriculture Development Office (DADO) and NGOs are organizing vegetable collection centers to facilitate collection from the pocket areas of Birendranagar and Chhinchu.

Butwal wholesale market

Butwal, located in Western Development Region, is one of the biggest vegetable market centers of the country. The wholesale market in Butwal transacted an average of 50 MT of

vegetables daily. However, there is no specific service regarding packaging, and no process for packaging is in development. There is a cold storage in Bhairahawa, mainly used for storing potatoes. However, chilled chambers or cold storage for other vegetables is

2.6 Vegetable Marketing Flow in Nepal

In the case of Nepal farmers (producers), the most common marketing channel is this sequence: middlemen to retailers to consumers. Well organized marketing channels do not exist. Marketing of vegetables in the study areas are carried out in the following ways.

Farm-gate Selling
This is not a prominent market practice. However, some farmers sell their vegetables to the buyers at the farm-gate. In this mode of marketing, buying and selling of vegetables and other goods may be on an individual basis. Buyers go to the farm, usually at a fixed time given by producers, though it can occur at any time without notice. In the case of fruits, sometimes, the produce can be sold ñin the field,ò and the buyer arranges for its harvesting. In the study area, farmers collect their vegetables in their collection center, and buyers purchased their produce from these collection centers. There are two types of farm gate selling: organized and unorganized farmersô collection centers. The farm-gate price is higher in the organized farmersô collection centers than in the unorganized farmersô collection centers.

Direct Selling
Ten percent of farmers surveyed prefer to sell their products after harvesting them by themselves, believing that they will get a better price for their produce this way. In this case, after harvesting, farmers do general grading and bring their produce in bamboo baskets (*Dokos)* to the nearby market on foot. In some cases, they have permanent buyers in the *bazzar (local market),* and sometimes they visit house-to-house carrying their fresh vegetables. This is time consuming and exhausting. Some farmers have improved this method by using bicycles and/or motorcycles.

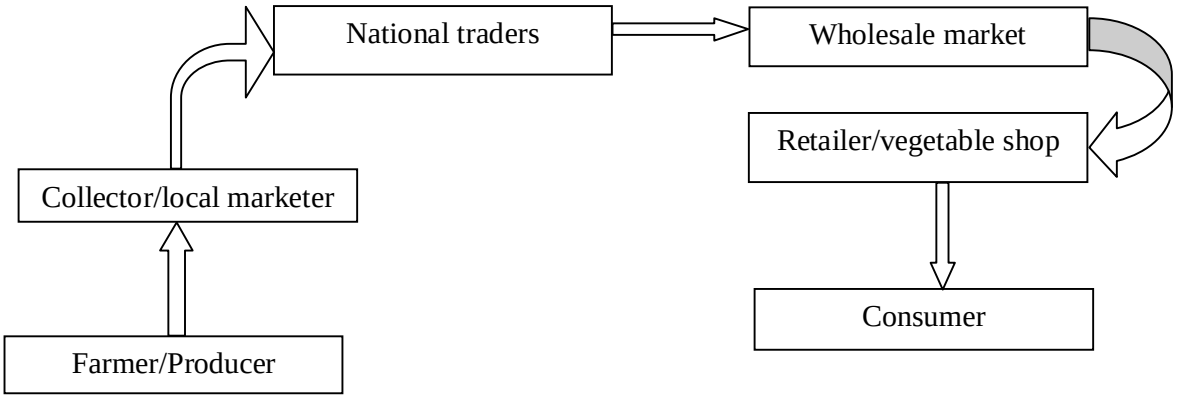
Selling to Middlemen
Direct selling is decreasing as the volume of production increases. It is not possible or profitable for producers to sell their products directly to consumers, so selling to a middleman is an oft adopted strategy by rural and small-scale farmers. In addition, door-to-door selling makes price setting difficult because farmers have little information regarding prices being charged by other sellers. Engaging a middleman who is willing to collect products from different producers and sell them to retailer to consumers provides employment and income to both producers and the middleman. Irrespective of volume, a middleman collects products from producers in rural areas, and after collecting a large enough volume, he/she sells the collection at market price at a retailerôs shop in urban areas where demand is high. In areas where there is no strong cooperative network and road access to farms is limited, middlemen are key to bringing product into the market place.

Group/ Collective Marketing
Farmers in marketing groups or cooperatives bring their produce to collection centers that are managed by farmers marketing management groups, or they wait for traders at collection centers.

Common vegetable flow in Nepal
Most of the markets in Nepal are functioning as shown in Figure 4 (schematic diagram).The model is based on the collection of information through field visits to the major wholesale

markets and collection centers. Middle marketers are mainly responsible for collecting the products from different places and delivering the products to the wholesale market. The products from wholesale markets are supplied to retailers/vegetable shop owners and then to consumers. The number of steps for a commodity to reach to the consumers depends upon the location of the market and the targeted place to be delivered.

Figure 4: Common Flow of Vegetable in Nepal



2.7 Costs and Gross Margin Calculation

The distribution of costs and gross income at different levels is important in the business of vegetables. Being highly bio-degradable, fresh vegetables require greater attention during harvesting, packaging, and transporting from the point of production to the final market. The marketing cost of the vegetables mainly involves the cost of post-harvest activities incurred before reaching the terminal market (consumer). This includes cost of harvesting and packaging (material and labor costs), handling (sorting, cleaning, grading, loading, and unloading), transportation and tariff, tax, and continental costs. Generally, these components constitute a large share in the total margin between the final retailer price and the cost of production (or farm-gate price), especially when the production pockets are at a considerable distance, e.g. a one-day walk from the market linking roads.

The margin calculation is done to show the distribution throughout the various actors as the off-season vegetables move from production to local traders, wholesalers, retail markets, and finally to consumers. The summary of it is presented in the Table below, details in Annex 1.

Table 5: Profit Margin at Different Levels

Vegetables	Farm Gate		Collection center		Wholesale		Retail	
	Price	Margin	Price	Margin	Price	Margin	Price	Margin
Cabbage	5.00	1.25	6.60	0.60	10.84	1.41	18.00	5.70
Tomato	12.00	5.86	15.07	1.37	21.58	2.81	30.00	4.59
Cauliflower	10.00	5.55	12.43	1.13	17.88	2.33	25.00	4.74
Chili	12.00	7.06	14.80	1.34	20.74	2.70	30.00	6.59
Cucumber	19.00	14.10	22.49	2.04	29.26	3.82	35.00	4.28

Source: Field Survey, 2011

The highest margin is in cucumber at NPRs 14.10, followed by chili at NPRs 7.06 and tomato at NPRs 5.86. The lowest margin of NPRs 1.25 is obtained in cabbage. In collection centers, the margin is 10 percent of purchasing cost for all the vegetables. At wholesale level, all vegetables have the margin of 15 percent from purchased price. The retailer gets the maximum margin of NPRs 6.59 for chili followed by cabbage at NPRs 5.7.

Table 6: Average Cost, Return and Net Profit of Selected Vegetables (2005/06)

Crop	Land type*	Yield MT/ha	Total Cost ('000' NPRs/ha)	Value of Product (NPRs '000/ha)		Gross Income (NPRs/ha)		Cost NPRs /Qt	Net Profit ('000 NPRs/ha)	
				F.Gate	Market	F.Gate	Market		F.Gate	Market
Chili	H/UIR	16.9	36.4	265.3	320.0	265.3	283.6	215.0	228.9	53.0
Tomato	H/IR	23.0	74.4	294.2	402.4	294.2	328.0	484.0	219.8	105.9
Tomato	H/UIR	24.4	73.5	235.2	456.8	294.2	383.2	452.0	220.7	160.1
Cauli	H/IR	18.4	56.4	119.2	171.2	119.2	114.7	306.0	62.7	501.6
Cabbage	H/IR	29.5	49.6	164.3	359.6	164.3	310.0	168.0	114.6	192.4
Cabbage	H/UIR	28.3	59.3	127.2	342.0	127.2	282.8	210.0	67.9	212.0
Onion	T/IR	24.2	35.4	208.6	368.8	209.0	333.3	140.0	173.6	157.6

*H/UIR: Hill Unirrigated; H/IR: Hill, Irrigated; T/IR: Terai, Irrigated Source: VDD 2066/67

2.8 Import and Export status of vegetables in Nepal

Among off-season vegetables, the maximum import from India is onion, followed by chili (Table 7). In terms of economic value, onion stands to be highest with NPRs 661,186,159, followed by chili with NPRs 20,2836,365 and tomato with NPRs 10,782,730. Cabbage has the lowest import with 6,048 kg followed by cauliflower at 57,936 kg. Clearly, the production of off-season vegetables like onion, chili, and tomato should be cultivated in Nepal, with the necessary support to reduce the huge amount of import from India.

Table 7:7: Imports of some selected vegetables from India

Commodities	Quantity (kg.)	Value (NPRs)
Cauliflower	57,936	345,239
Cabbage	6,048	42,154
Tomato	1,492,077	10,782,730
Chili	5,643,299	202,836,365
Onion	61,682,318	661,186,159
Cucumber	281,858	1,969,987
Total	**69,163,536**	**877,162,634**

Source MoAC, 2010

The supply and demand is generally reflected from the foreign trade statistics. Nepal heavily imports vegetables (Table 8). The amount of export is minimal, thus there is a trade deficit.

Table 8: Export and import status of vegetables in Nepal

Year	Export (NPRs 000)	Import (NPRs 000)
2006/07	11,000	1,035,800
2007/08	17,500	1,210,900

Source Gautam, 2010

Table 9: Percentage share of some imported vegetables in Kalimati market (2065 B.S.)

Commodity	Source	percent of Import
Onion	India	94
Garlic	China	59
Green chili	India	27
Other vegetables	India	25

Source Gautam, 2010

Based on market arrivals in the Kalimati, onion and garlic are mostly imported. In case of other vegetables, 25 percent of the arrivals are imported (Table 9).

3. Value Chain Mapping – Functions, Actors, Relationships, Enablers

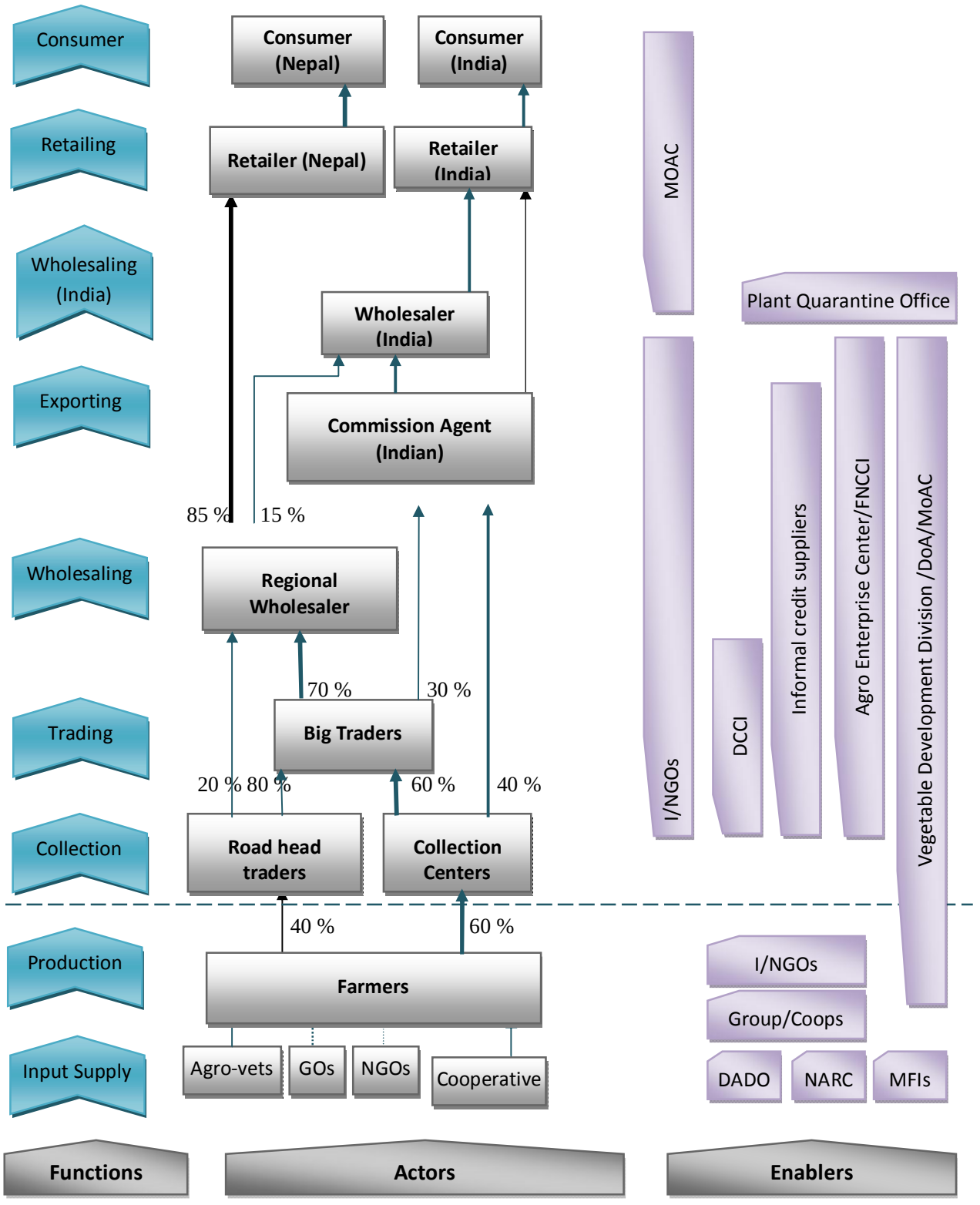
3.1 Value Chain Map

The value chain map is presented of three major corridors: i) Eastern corridor (Dhankuta-Dharan-Biratnagar and Siliguri), ii) Midwestern corridor (Kapurkot/ Dailekh-Nepalgunj/Tulsipur/Kohalpur) and iii) Western Corridor (Palpa-Butwal/Bhairahawa). The linkages are shown vertically from bottom to top. The left hand block lists the major function of the chain, which includes production, collection, trading, processing, trading, and retailing. During mapping, actors involved in this sector are listed and mapped according to their respective functions. Then the institutions supporting this sector directly or indirectly are listed as enablers. The value chain map provides a graphic representation of off-season vegetables as it moves from production to consumers, passing through different stages and processes.

3.1.1 Value Chain Map- Eastern Corridor

Dhankuta is the major production area of vegetables in eastern region. The vegetables produced in this area reache market mainly through Dhankuta-Dharan-Biratnagar-Siliguri (India) corridor. Around 60 percent of off-season vegetables produced by farmers in Dhankuta are collected by the collection centers. The remaining 40 percent are collected by road head traders. Both collection centers and road head traders supply the major part (60 percent and 80 percent respectively) to big traders. Besides selling to big traders, the collection centers also supply directly to the Indian Commission Agent. The big traders give 70 percent of their vegetables to regional wholesalers and 30 percent to the Commission Agent (India). Regional wholesalers also receive directly from road head traders. From the regional wholesalers, more than 85 percent of the vegetables reach the retailers in the major domestic market hubs. The regional wholesalers also supply some quantity (around 15 percent) to the Wholesaler of India. The Indian Commission Agents works in 6 to 7 percent commission, and supplies to Indian Wholesalers and Retailers. The detailed map of the eastern corridor is presented in Figure 3.

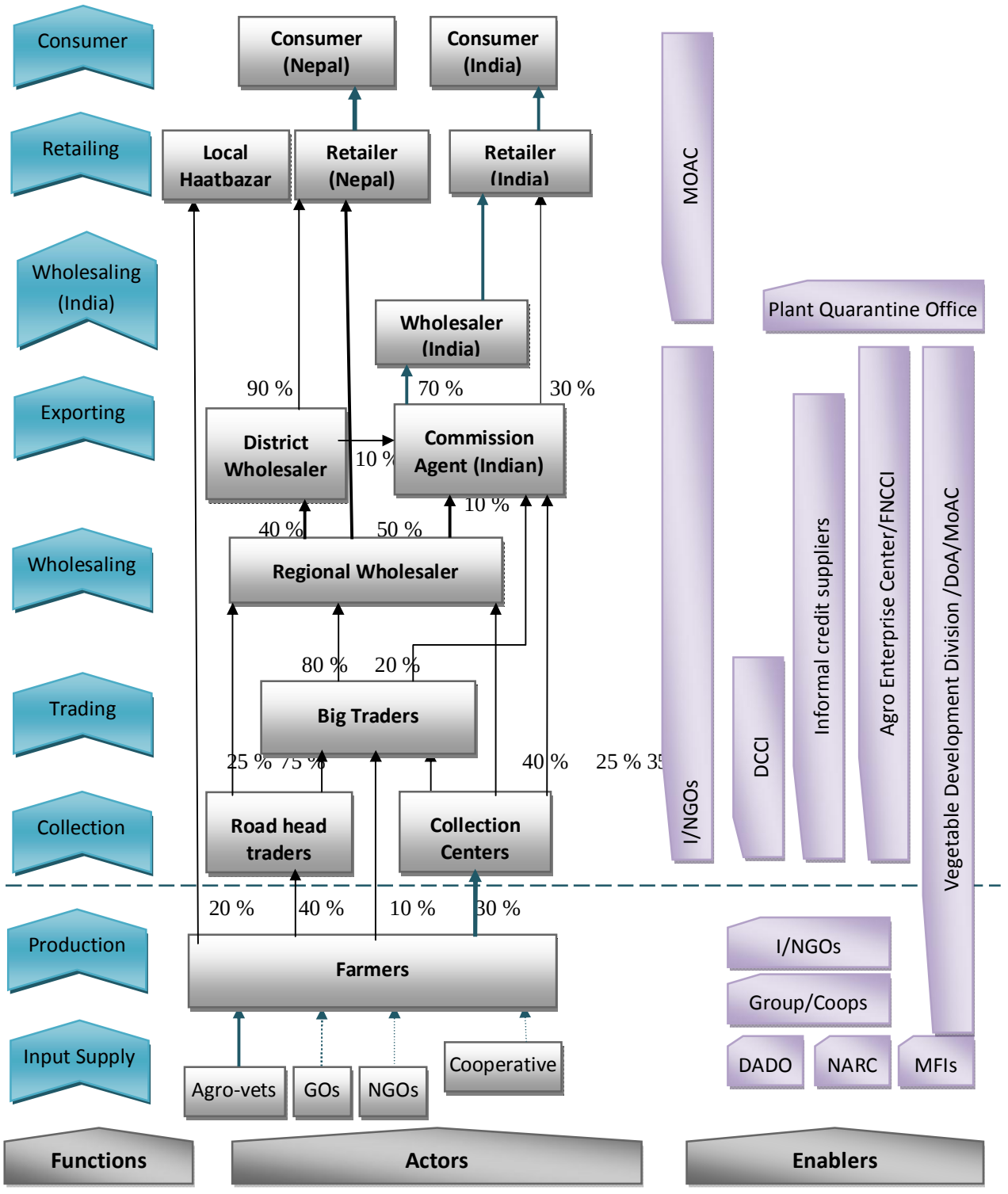
Figure 3: Value Chain Map of Off-season Vegetables in Eastern Region



3.1.2 Value Chain Map- Midwestern Corridor

Surkhet, Dailekh, and Kapurkot are the major off-season vegetable production areas of midwestern Nepal. The vegetable produced in this region reach the markets in Nepalgunj, Kohalpur, and to bordering Indian markets through various marketing channels. Farmers supply their vegetables mainly to road head traders (40 percent) and collection centers (30 percent). Twenty percent of vegetables from farmers are sold in local market ó*Haatbazar* . Some, around 10 percent, are directly purchased by big traders. Roadside traders and collection centers are major supplier for big traders. Big traders in turn sell mostly to regional wholesalers, through whom the vegetables reach to domestic retail markets directly or through district wholesalers. Around 20 percent of the supply from big traders, 25 to 35 percent of the supply from collection centers, and 10 percent from regional wholesalers are exported to India through the Indian Commission Agent. The detail is presented in the following value chain map of the midwestern Corridor, Figure 4.

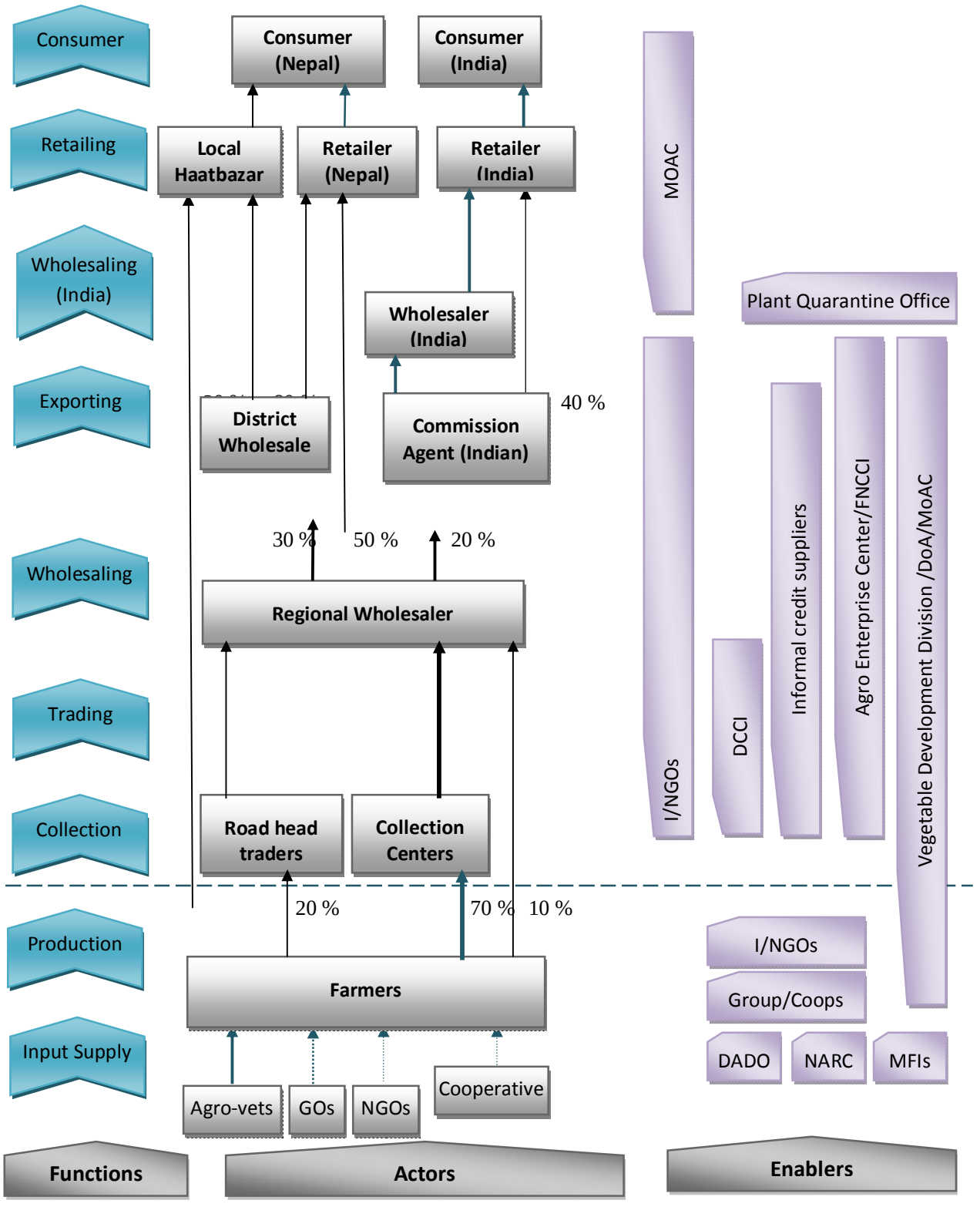
Figure 4: Value Chain Map of Off-season Vegetables in Midwestern Region



3.1. 3 Value Chain Map- Western Corridor

Palpa is the major off-season vegetable producing district in the western region. From here the vegetables reach Butwal, Bhairahawa, and India. Seventy percent of the off-season vegetables go through collection centers and 20 percent is marketed by road head traders. Also, 10 percent of the vegetables are sold directly to regional wholesalers. Some volume of production is sold in local markets by farmers. Similarly, from road head traders and collection centers, the vegetables go to regional wholesalers who either sell directly (50 percent) to retailers in Nepal or go through district wholesalers. Around 20 percent of the vegetables are exported by regional wholesaler to India through the Indian Commission Agent. The value chain map is presented in Figure 5.

Figure 5: Value Chain Map of Off-season Vegetables Western Region



3.2 Functions and Actors

Farmers
Farmers are the primary and most valued actor in the agriculture value chain. Two categories of farmers were noticed in production areas: subsistence farmers and commercial farmers. Subsistence farmers generally purchase and organize necessary agro-inputs and sell the produce at local markets (*haat bazaar)*. The local consumption of off-season vegetables is 30 percent of the total production. The rest is sold to outside markets through various levels of traders.

The diverse agro-climatic conditions can make growing off-season vegetable crops highly cost effective and competitive, and provide vast opportunities. Unfortunately, these opportunities have not been exploited by the farmers due to the lower price they receive for their produce in the collection centers or markets, as well as bearing the cost of post-harvest losses.

Collectors/traders
Collectors and traders are the key actors in the off-season value chain, responsible for the trading of 70 percent vegetables from production pockets to wholesale markets. Their trading activities include buying and assembling, repacking, sorting, selling to middlemen, transporting, and selling to wholesale markets. Deducting all the costs incurred these activities, including the taxes and transport damage losses; their market margin share comes to about 10 percent.

Big Traders: The traders who collect products in bulk amount from roads or collection centers are the big traders.

Regional Traders: The traders who collect vegetables from collection centers and road heads and supply to wholesalers of other districts are regional traders.

Indian Commission Agents: The actors who purchase product and sell on commission basis to the wholesalers or retailers are the commission agents. The vegetables of the eastern region are traded through the commission agents of Siliguri.

Wholesaler
Wholesalers are mainly involved in buying vegetables from regional traders and supplying them to retailers. They also store product, usually only for a maximum of two days. They generally make an estimated profit margin of NPRs 0.5 to 1 per kg. Their market margin share comes to about 5 percent. They are mainly located in *Mandis* where there are market hubs with some infrastructure such as office buildings, open stores, transaction sheds, and shop sheds. These market hubs are usually established with government support and operated by local committee.

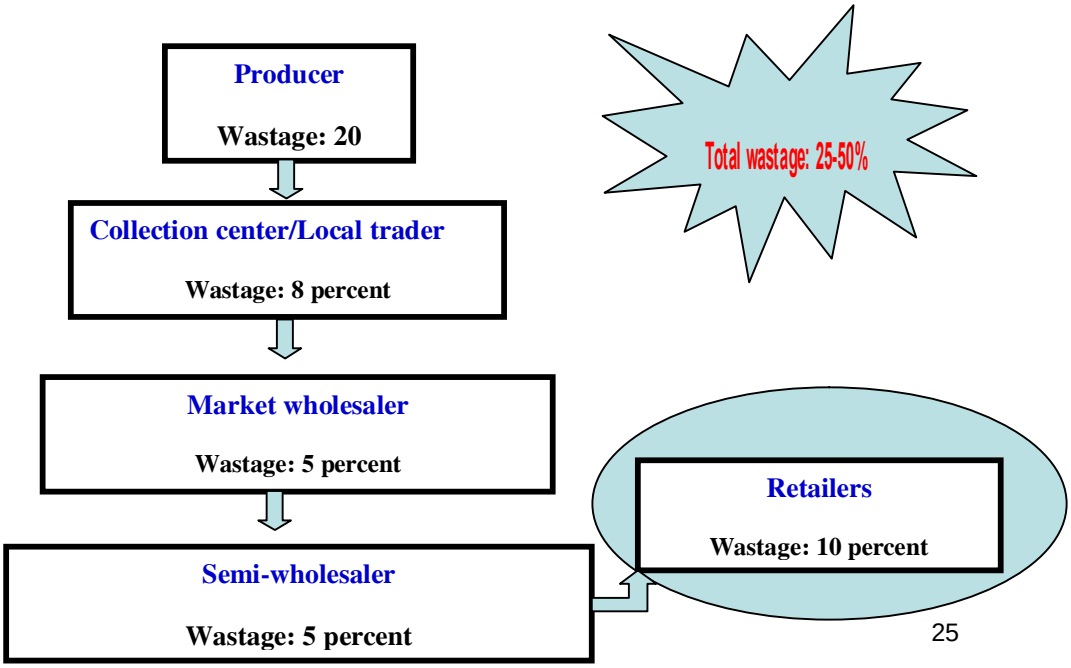
Retailers
Retailer involvement in the chain includes buying of vegetables, transport to retail shops, grading, displaying, and selling to consumers. Their market share is 15 to 20 percent. Retailers are not organized into a formal organization; they all do their business individually.

Post-Harvest Management

In most of the production pockets, grading is not practiced for off-season vegetables. This is due to no or minimal price difference in the graded versus non-graded product, and the high labor requirement for grading. Also, storage of vegetables is not practiced, and farmers prefer not to harvest vegetables when the price goes down.

For packaging, traditional practice such as the use of Doko is common in these areas. However, farmers are slowly adopting improved packaging materials such as plastic crates. While using Doko, farmers lose about 10 percent of product during transportation. Wooden boxes are not used, as they add unnecessary volume and contribute to the additional tare and weight. In the study area, many farmers do not use plastic crates due to the high initial investment (NPRs 300 per crate). Farmers like to use plastic crates if they are subsidized, as they minimize loss and maintain quality. Traders have begun using plastic crates for packaging of tomato fruits. Traders normally use mini trucks for transportation from production sites to markets, though around 10 percent of the transportation is done in passenger buses. Traders estimate that they lose 5 to 8 percent during transportation from collection centers to wholesale markets by mini truck. The total post-harvest loss in off-season vegetable from producer to retailer is estimated to be 25-50 percent. The post-harvest losses are mainly due to improper harvesting, handling, packaging, and poor facilities at collection centers. Figure 6 presents the losses incurred at various levels of the chain.

Figure 6: Current Post-harvest losses of Off-season Vegetables in Nepal



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3.3 Enablers and Facilitators

Enablers include all chain-specific actors providing regular support services or representing the common interest of the value chain actors. Functions at the enabler level include public research and technology development, agreement on professional standards, promotional services, joint marketing or advocacy, and other support services.

Enablers in production and local processing functions
District Agriculture Development offices (DADO) and their services centers, and research stations of the Nepal Agriculture Research Council (NARC), Horticulture Research Division are working to develop and disseminate different technologies for off-season vegetable production. Similarly, cooperatives and farmersô groups are facilitating collective input procurement and in some cases selling of off-season vegetables. Microfinance institutions and cooperatives assist farmers by providing loans during plantation time. Some NGOs provide technical and financial assistance to cooperatives in production and marketing.

Enablers in trading and export functions
Business Membership Organizations (BMOs), like the District Chamber of Commerce and Industries (DCCI) and Agro Enterprise Center (AEC), are supporting businesses by providing services such as market information and facilitation for market linkages. The Agriculture Information and Communication Center, Directorate of Agribusiness Promotion and Marketing Development, National Plant Quarantine Program, National Agribusiness Promotion Program, and the Agri-Commodity Export Promotion Program also facilitate trading activities by providing technology, establishing collection centers, and supporting export-related activity. Similarly, the Trade and Export Promotion Centre maintains trade and export-related information.

At a higher level, the Ministry of Agriculture and Cooperative (MOAC), Department of Agriculture (DOA), Ministry of Commerce and Supplies, Federation of Nepalese Chamber of Commerce and Industries (FNCCI), and Ministry of Commerce facilitate for business through policy lobbying, policy formulation, and bilateral trade agreements. The details on each enablers and facilitators are described below.

3.3.1 Public Actors

Department of Agriculture: District Agriculture Development Offices (DADO) operate under the Department of Agriculture of the Ministry of Agriculture and Cooperative and are functional in all 75 districts of Nepal. DADOs are at the center of all activities related to agriculture in associated districts. In off-season vegetables, DADOs are implementing various activities which are mainly focused at the production level. Group formation, technical advice to growers, technology demonstrations, and trainings are some of the activities of DADO.

Nepal Agricultural Research Council (NARC): At the national level, NARC has the mandate to conduct agricultural research in the country with the goal of raising the populationôs economic level. The Horticulture Research Division, Khumaltar, carries out research in off-season vegetable production, disease and pest management, and storage. To date, it has developed the popular tomato variety Sirjana, and it also produces breeders' seed.

Plant Protection Directorate (PPD): The PPD is a government agency responsible for the program implementation on the Plant Protection Sector and is responsible for different national level programs: the office of Registrar of Pesticides, the National Plant Quarantine

Program, and Regional Plant Protection Laboratories. During export of vegetables, the plant quarantine offices work on legal formalities of export.

Nepal Agriculture Research and Development Fund (NARDEF): NARDEF funds various research and development projects of NARC, government extension offices, and different NGOs.

Trade and Export Promotion Centre (TEPC): The Government of Nepal established TEPC, a national trade promotion organization, in November 2006, with the objective of promoting foreign trade, particularly export trade.

3.3.2 Government Projects

Project for Agricultural Commercialization and Trade (PACT): The development objective of PACT is to improve the competitiveness of smallholder farmers and the agribusiness sector in selected commodity value chains in 25 districts. PACT covers these components: agriculture and rural business development; sanitary and phyto-sanitary facilities; food quality management; and project management, monitoring and evaluation.

Commercial Agriculture Development Project (CADP): CADP began in 2007 with the objective of reducing poverty in 11 districts in the Eastern Development Region (EDR) of Nepal. The project aims to accelerate the process of agricultural commercialization in the eastern development region by building on earlier project initiatives and responding to the needs of stakeholders by strengthening linkages and ensuring fair benefits to disadvantaged communities and women.

High Value Agriculture Project (HVAP): The HVAP project formally launched this year, concentrating its activities in the mid-western development region. The project primarily focuses on an Inclusive Business (IB) approach, whereby it seeks to mitigate poverty by incorporating lower income communities within the supply chain of larger, more established companies. Off-season vegetable is one of the priority sub sectors of this project.

3.3.3 Non-government Organizations and Projects

AEC/FNCCI: FNCCI created the Agro Enterprise Center (AEC) as an autonomous unit in September 1991. It has its own optimal guidelines and policies, and program approval is given by a separate Board comprising of FNCCI executive members, representative from District Chambers of Commerce and Industry, Commodity Associations, and permanent invitees from various related government agencies or who are donors. The mission of this center is to expand and strengthen market-oriented private sector driven agro enterprises in order to increase the value and volume of high-value products sold domestically and internationally.

MEDEP: The Micro-Enterprise Development Programme (MEDEP), started in 1998, is a multi-donor funded poverty reduction initiative implemented by the Government of Nepal, with the technical and financial support of UNDP. The program helps improve the livelihood of the poor and excluded communities by creating various income generating opportunities through skill development trainings, and provides support to establish small business enterprises specifically in the vegetable sector.

FORWARD: FORWARD is a national NGO established in 1996, committed to helping the rural poor address social disparity and poverty. It has completed various projects on off-season vegetable production and marketing in more than 20 districts of Nepal.

CEAPRED: Since its establishment, CEAPRED has focused on sustainable poverty reduction and enhancement of food security and livelihoods of the poor, and disadvantaged and deprived families, including small and marginal farmers. CEAPREDôs approach to poverty reduction consists of promotion of new and better economic opportunities at the local level, and linking these opportunities to the markets. Some examples of CEAPREDôs initiatives, which have been widely recognized and referrenced, include a commercial off-season vegetable production program launched in eastern Nepal in the early 90s, and a commercial vegetable seed production program currently in operation in several districts of Nepal.

IDE Nepal: International Development Enterprises (IDE) is an international non-government organization, working in Nepal for two decades. Its mandate is to develop and disseminate lo -cost irrigation technologies for small holder farmers of Nepal. In vegetable production and marketing, it has completed various projects in different districts of Nepal.

3.4 Vertical and Horizontal Linkages

Vertical Linkages: Vertical linkages can be attained through cooperation between the different players or firms, and they have the benefits of transferring skills from one player to another, as well as reducing transactions costs. Considering the off-season vegetables value chain, vertical linkages exist between cooperatives and growers, since cooperative distribute the inputs and buy the products of farmers, as with the Sindhuwa cooperative, Dhankuta. With SIMI, a USAID funded project, there was a marketing and planning committee (MPC) in major market centers where there is membership of farmersô groups and traders. The MPC plan the required inputs and production potential in the catchment area and plan for the output marketing accordingly.

Horizontal linkages: This is the relationship among different players operating at the same level of a value chain. At the farmersô level, there are the production groups and cooperatives where members regularly conduct meetings and plan for input procurement and output marketing. In most of the wholesale markets, traders fix the price of product collectively for a particular day and sell the vegetables accordingly.

3.5 Value Chain Governance

Nepal is heavily dependent on India for vegetables, and therefore the vegetables value chains are highly influenced by the supply from India. In most cases, the business relations between the various operational actors are of free market exchange and uncoordinated. The transaction pattern in export market is mainly on commission basis where the commission agents charge 6 to 7 percent as their fee.

Due to the lack of a proper market information system and minimal bargaining power, farmers are forced to sell their product at the price offered by traders. Traders usually refer to Indian markets for price fixation. In some cases, there are conflicts among the traders and exporters regarding payment and failure to keep their commitment.

Overall, the governance of the off-season vegetables value chain is buyer driven with minimum trust between various actors. Traders are always complaining that the farmers are not providing quality product while farmers are blaming the traders for offering low prices.

4. COMPETITIVE ANALYSIS

A SWOT analysis, examining strengths, weaknesses, opportunities, and threats, was completed of the off-season vegetables market in view of import substitution. Strengths and weaknesses here refer to the internal factors governing the off-season vegetables sub sector, while opportunities and threats refer to external factors in the business environment.

Table 10: SWOT Analysis of Off-season Vegetables Sub-sector

Strengths	Weakness
Production	***Production***
Å Low initial investment	Å Lack of year round irrigation
Å Agro-vets available in production pockets	Å Lack of all-season agricultural roads
Å Comparative advantage over other cereal and cash crops	Å Poor access to quality inputs (seed, fertilizer, pesticides, micronutrients) and credits
Å New, high-yielding varieties available based on geographical areas	Å Shortage of skilled labor
Å Improved technology ready for wider adoption	Å Inadequacy of internally grown high-quality seeds of suitable varieties
Å Abundance of suitable and potential microclimatic pockets	Å Farmers not using improved packaging or practices of cultivation, harvesting and post-harvest management
Å Vegetables grown in hills are competitive in the domestic market	Å Quality inputs not available in time and are very expensive
Å Farmers becoming more aware about the domestic market potentials	Å Production centers are scattered and are far from road heads and major market centers
	Å Lack of technical knowledge (use of fertilizer, plant protection measures) and technology to rural farmers for commercial scale production
Processing	Å Questionable quality of inputs; e.g., quality of hybrid seeds imported from India might not be known; mixed seed and low quality seed, fertilizers, and pesticides.
Å Grading is gradually being introduced	Å Dependence on India for inputs (especially hybrid seed, fertilizer, plant protection chemicals and micro nutrients)
	Å Production centers are scattered and are far from market centers
Marketing	
Å Farmers are being united in groups and cooperatives for marketing their produce	***Processing***
Å Existence of some established farmers organization, cooperative societies, and collection centers for marketing	Å Lack of technical knowledge to rural farmers on harvesting, post-harvest handling, grading, packing and storage technology
Å Cooperative marketing system in the developing process	Å Wastage due to rotting during storage
Å Farmers establishing linkages with wholesalers and retailers in the local markets	Å Unavailability of proper packaging materials (e.g. tomato packed in *Doko* is damaged and quality and quantity reduced)
Å AEC and Marketing Development Directorate are providing price information of various markets of Nepal	Å Farmers are not aware of vegetable processing technology
Enabling environment (Policy and Institutions)	
Å Government has categorized off-season vegetables as a high value crop in Nepal and policy supports are available to provide facilities to the farmers	

	Marketing Å Farmers lack business orientation Å Limited access to reliable market information for farmers Å Farmers not aware about market potentials of off-season vegetables in various northern markets of India Å Unorganized market centers at the production areas Å Poor and inefficient supply chain which causes post-harvest losses Å High porter transport cost from production area to road head ***Enabling environment (Policy and Institutions)*** Å There is lack of common platform to discuss on the issues of off-season vegetables including all the chain actors.
Opportunities ***Production*** Å Climatic suitability of hills to produce vegetables in off-season Å Availability of government's extension and research offices with qualified manpower Å Various organizations such as CBOs, NGOs, and Co-operatives are supporting farmers for off-season vegetable cultivation. Å DADOs are providing production material and technical services to the farmers ***Processing*** Å Availability of post-harvest handling, processing and packaging technologies ***Marketing*** Å Availability of plastic crates in the market Å Presence of traders/exporters Å Supply potentials at attractive prices of cauliflower, cabbage, chili and tomato in the summer and early winter months in Terai and northern border markets of India Å Increasing demand of off-season vegetables in the domestic markets, possibility of export market to different countries ***Enabling environment (Policy and Institutions)*** Å Existing opportunities to trade at local regional and global levels and government liberal policy support in providing more open export markets to the vegetable traders. Å Availability of commerce and trade related department to provide facilities and advise exporters/traders; availability of processing and packaging technology.	**Threats** ***Production*** Å If Nepal emerges as a transit passage between India and China, it is likely to lose competitive advantage unless backed by more quality and efficient production Å Possibility of oversupply of off-season vegetables of better quality from Tibet or China and hilly regions of India. Å Epidemic occurrence of pests and diseases Å Intense competition from highly subsidized Indian farmers for vegetable production ***Processing*** ÅHigh post-harvest losses ***Marketing*** Å High seasonal price variation Å Existing marketing, trading system , institutional and infrastructural support is poor in Nepal Å Inconsistency in internal as well as external demand and lack of coordination between production and marketing ***Enabling environment (Policy and Institutions)*** Å Illegal tax and threats from many groups especially during transportation

Source: Field study and the review of previous studies

5. CONSTRAINTS AND OPPORTUNITIES

5.1 Constraints

5.1.1 Input Supply

Quality planting materials: Seed is the primary planting material for vegetable crops. Most farmers are using poor quality seeds, as high quality seed are often not available at planting time and are expensive.

Fertilizers and Pesticide: Traditional practices are rapidly being replaced by indiscriminate use of toxic pesticide and chemical fertilizers, causing many health complications. Magnifying this problem is the lack of technical knowledge on the proper usage of chemical pesticide among.

5.1.2 Production

Irrigation: For vegetable farming, irrigation plays a major role for yield and productivity. Lack of irrigation facilities causes inadequate production in farms, as have recent instances of a late monsoon and prolonged drought.

Soil fertility management: For sustainable vegetable production, organic manure is important. However, commercial farmers are becoming more dependent on chemical fertilizers rather than farm yard manure and compost.

Low productivity: The vegetable productivity in Nepal is considerably low when compared to other countries of the world.

Labor shortage: Due to lack of employment opportunities in Nepal, the migration of youths has been increasing significantly and is directly affecting the availability of laborers in production pockets.

5.1.3 Post-Harvest and Processing

Post-Harvest Losses: Due to the perishable nature of vegetables, post-harvest loss is high at about 20 to 50 percent. Poor post-harvest handling practices regarding cleaning, sorting, grading, and packaging are largely responsible.

5.1.4 Marketing

Market information: There is limited access to reliable market information on price, quality, and quantity for farmers and local traders in production pockets.

Unorganized market center: Most of the vegetable markets are not organized, and existing markets are congested with inadequate storage facilities.

Collection centers: There are limited collection centers at production sites, so marketing and handling of off-season vegetables is difficult.

Proper packaging and transportation: Poor packaging systems and lack of special transportation facilities for vegetables have affected the timely and safe handling of vegetables to destination markets.

5.2 Opportunities

5.2.1 Input Supply

Availability of inputs: Seeds, fertilizers, bio-fertilizers, chemical pesticides, bio-pesticides, and other inputs are available in major markets. Similarly, there is a good presence of agrovets in production pockets.

5.2.2 Production

Climatic suitability: The hills of Nepal are suitable for production of off-season vegetables with specific taste and quality. There is good opportunity to produce cauliflower, cabbage, tomato, onion, chili, and cucumber during the rainy season when the plain areas are not suitable due to water logging conditions.

Support of input and technical service: Various organizations such as DADOs, NGOs, and cooperatives provide production inputs and technical services to the farmers.

5.2.3 Processing and Marketing

Packaging materials: Packaging materials like plastic crates are available, and with the support of DADOs sometimes available at subsidized rates.

Increased demand: Demand for off-season vegetables is increasing, raising the possibility of export markets to different countries.

Attractive price for off-season vegetables: Cauliflower, cabbage, tomato, chili, onion and cucumber bring attractive prices in the summer and early winter months in the Terai and in Indian markets.

5.2.4 Government policy

Opportunities exist to trade at national, regional, and global levels, and the government has a liberal policy to support more open export markets to the farmers/traders.

6. STRATEGIC AREAS FOR NEAT INTERVENTIONS

The activities and actions identified by the present study are summarized in the following points: the short-term proposed activities for immediate outcomes of the NEAT project; the effects of the short-term strategies that will be seen as outcomes of the NEAT project, the long-term strategy to strengthen the off-season vegetables subsectors of Nepal; and outcomes that will be seen beyond the project period.

6.1 Short-term Interventions

6.1.1 Production

Introduce technological guidelines for off-season vegetable production: Commercial production of vegetable crops starts with efficient technology. Provisions of technological guidelines for production and post-harvest handling at farmersô level are necessary. There is also the need to introduce appropriate varieties for particular regions to ensure superior quality. For example, Sirjana is the suitable variety of tomato under polyhouse conditions in hills. In areas where plastic house technology is not possible, the varieties Swaraksha, Dalila and NS 2535 should be promoted. In case of cauliflower, Jyapu and Kathmandu Local varieties are suitable for the mid hills due to their higher yield and good taste. However, in

the rainy season, Silver cup-60, Milk way, Rami, and Snow King varieties should be scaled up. Green coronet, green stone, and T-621 varieties of cabbage are suitable for the hills due to good head, size, wider adaptability, and uniformity. In onion, Agrifound dark red variety is best for off-season production. Jwala, Karma 777, Akash, and Super tara varieties of chili should be introduced in mid hills and Terai. For cucumber, Ninja 179, Nepa Tusi, Beli and Garima are suitable for mid hills and Terai.

Introduce poly-house technology: Off-season tomato, which is produced in the hills from July to November, is one of the cash generating crops suitable for small and poor farmers. During July to November (rainy season), tomatoes have huge export potential for the plains of Nepal, India, and Bangladesh. The off-season tomato under open field has been constrained mainly by high rainfall, bacterial wilt, late blight, alterneria, and septoria leaf spot. Therefore, the standard poly-house structure with subsidized rate should be introduced in production pockets.

Micro irrigation technology: Irrigation plays a major role in yield and productivity for vegetable farming. Late monsoon and prolonged drought affect production. Therefore small irrigation systems for both the Terai and Hill areas should be promoted. These may be shallow tube wells in the Terai, and small irrigation systems in the hills, including drip-irrigation and water tanks.

Training and Exposure Visit: Almost all off-season vegetables grown in India come from its three hilly states: Himachal Pradesh, Jammu and Kasmir, and Uttrakhand. Farmers of these areas are having greater success than their Nepali counterparts, so a training/exposure visit to India for lead traders and farmers is recommended.

Production training: Off-season vegetable production can be improved significantly with a few small changes, such as using plastic sheets and by draining excess soil moisture during rainy summer and autumn seasons. Training in these methods is recommended.

6.1.2 Marketing

Promote grading and collection centers: Development of market structure is an important requirement for effective marketing. Building grading and collection centers can reduce post-harvest loss and also ease bulk collection and transportation. This can be done with matching grants cooperatives.

Entrepreneurship Development Training: Entrepreneurship development training for the literate cooperative members in fund utilization and management, net cash income, net profit, risk analysis, and market management knowledge and skills should be provided.

Support for plastic crates: Because tomatoes are highly perishable, farmers are losing a significant amount each year. Bhattarai and Gautam have reported up to 50 percent post-harvest loss of tomato in Nepal. Post-harvest loss could be considerably reduced by packaging in plastic crates. Plastic crates should be subsidized for farmers, groups and cooperatives, and local traders.

Establishment of off-season vegetable call center: The market price of vegetables fluctuates dramatically in both domestic and export markets. Similarly, new varieties, inputs, and technologies have been developed by researchers. An established marketing and

technology information center (call centers) at major production districts with the involvement of cooperatives, local CCIs, and DADOs is necessary.

Post-harvest management training: In Nepal, there is a 25 to 50 percent post-harvest loss in vegetables (Bhattarai, 2005). Reducing these losses is more economical solution, rather than increasing production. Therefore, there is need to provide training to the farmers and traders for increasing their knowledge on post-harvest handling technologies.

Packaging and storage training: Packaging is a fundamental tool for post-harvest management of highly perishable off-season vegetables. At present, packaging systems still depend on traditional forms, such as bamboo baskets (Dokos) and gunnysacks. The use of plastic crates and corrugated fiberboard boxes must be encouraged. Similarly, proper temperature and humidity management are very effective tools in ensuring that produce remains in good condition throughout storage. Training in packaging and storage is recommended at the trader, wholesaler, and retailer level.

6.1.3 Policy and Institutions

Provision of crop insurance: Heavy rainfall, hailstorm, or disease can cause significant or complete loss of crop. To encourage farmers in off-season vegetable production, crop insurance and minimum price guarantee should be provided.

Support for Institutional Development to Cooperatives: To foster institutional development of cooperatives, there should be an effort to raise awareness and develop the leadership skills of cooperative members. Training programs should be organized on accounts and record keeping as well as cooperative management. Furthermore, the availability of adult literacy classes (ALC) for illiterate cooperative members will increase their knowledge and skills. Post Literacy Class (PLC) should also be organized for prospective members who complete ALC. PLC will help cooperative members acquire further knowledge and skills for maintaining accounts and keeping records for organizations as well as their own vegetable enterprises.

Publication and Publicity: Basic and simply written books, booklets, leaflets and posters on off-season vegetable production techniques, post-harvest management, and marketing technologies of each crop can be developed and circulated to relevant farmers and traders.

6.2 Long-term Interventions

6.2.1 Production

Development of off-season vegetable blocks: Most of the farmers in vegetable growing districts are small and scattered. Commercialization of off-season vegetables is only possible through the mobilization of large groups of farmers in targeted commodities. For this purpose, the blocking approach for off-season vegetable production should be promoted.

Development of hybrid varieties: Work should done on hybrid seed production with the collaboration of NARC and private sectors.

Verification/Demonstration of different botanical pesticides: Biological pesticides such as Neem plant extracts, Banmara, Titepati, Asuro, Lantana, Garlic, Ginger, Timur, and other organic products should be evaluated for the management of various insect-pests. Locally available resources can be utilized, as well as IPM approaches with cultural practices such as

high ridge planting, multiple cropping with marigold, crop rotation, and other relevant organic measures. Activity should be conducted in collaboration with NARC and DADOs.

6.2.2 Marketing

Establishment of cold storage: To extend the shelf life of vegetables and to create time and space utility, the establishment of cold storage near Mandi (wholesale market) is recommended. This will reduce post-harvest losses.

Development of agriculture road: Competitiveness in vegetable production and promotion will be shaped by effective transportation, both accessibility and timely availability. Emphasis should be given to promote the development of agricultural roads connecting potential pockets with highways.

6.2.3 Policy and Institution

Government support for export promotion: For the export promotion of the Nepalese vegetables to the Indian markets, the government has to play an effective role to identify and minimize the non-tariff barriers that the Nepali off-season vegetables are currently facing. Some of the current issues and challenges include transferring of the Nepali products to Indian trucks at the borders, considerable delay in customs clearance, and the non inclusion of Nepali vegetables and their prices in the price bulletin published by the regulated markets.

Support for pesticide residue analysis: The excessive use of chemical pesticides creates serious problems, including environmental pollution, poor quality, and hazards to human health. Furthermore, pesticide residue in vegetables is a significant issue in export markets. NEAT should collaborate with Plant Quarantine and the Department of Food Technology and Quality Control (DFTQC) for access to laboratories, equipment, and tools in strategic locations for examining this issue.

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8. ANNEXES

Annex 1: Cost for Different Actors of Off-season Vegetables

Vegetables	Farmers		Collection center		Wholesale		Retail	
	Item	Cost	Item	Cost	Item	Cost	Item	Cost
Cabbage	Seed	0.50	Collection cost	0.5	Transport	2.00	Market Charge	0.10
	Fertilizer	0.25	Purchase	5.00	Load/ unload	0.25	Transport	0.25
	Labour	2.00	Loss (10 percent)	0.50	Taxes	0.25	Damage/ others	0.25
	Others	0.25			Purchase	6.60	Purchase	10.84
	Loss (15 percent on FGP)	0.75			Loss (5 percent)	0.33	Loss (8 percent)	0.86
	Total cost	**3.75**	**Total cost**	**6.00**	**Total cost**	**9.43**	**Total cost**	**12.30**
	Margin	*1.25*	*Margin (10 percent)*	*0.60*	*Margin (15 percent)*	*1.41*	*Margin*	*5.70*
	Farm Gate price (FGP)	**5.00**	**Local trader price**	**6.60**	**Wholesale price**	**10.84**	**Retail price**	**18.00**
Tomato	Seed	0.50	Collection cost	0.50	Transport	2.00	Market Charge	0.10
	Fertilizer	0.50	Purchase	12.00	Load/ unload	0.25	Transport	0.25
	Labour	2.25	Loss (10 percent)	1.20	Taxes	0.25	Damage/ others	0.25
	Others	0.25			Purchase	15.07	Purchase	21.58
	Loss (22 percent on FGP)	2.64			Loss (8 percent)	1.20	Loss (15 percent)	3.23
	Total cost	6.14	**Total cost**	13.70	**Total cost**	18.77	**Total cost**	25.41
	Margin	*5.86*	*Margin (10 percent)*	*1.37*	*Margin (15 percent)*	*2.81*	*Margin*	*4.59*
	Farm Gate price (FGP)	**12.00**	**Local trader price**	15.07	**Wholesale price**	21.58	**Retail price**	30.00
Cauliflower	Seed	0.50	Collection cost	0.50	Transport	2.00	Market Charge	0.10
	Fertilizer	0.50	Purchase	10.00	Load/ Unload	0.25	Transport	0.25
	Labour	2.00	Loss (8 percent)	0.80	Taxes	0.25	Damage/ others	0.25
	Others	0.25			Purchase	12.43	Purchase	17.88
	Loss (12 percent on FGP)	1.20			Loss (5 percent)	0.62	Loss (10 percent)	1.78
	Total cost	**4.45**	**Total cost**	11.30	**Total cost**	15.55	**Total cost**	20.26
	Margin	*5.55*	*Margin (10 percent)*	*1.13*	*Margin (15 percent)*	*2.33*	*Margin*	*4.74*
	Farm Gate price (FGP)	**10.00**	**Local trader price**	12.43	**Wholesale price**	17.88	**Retail price**	25.00

Chili	Seed	0.50	Collection cost	0.50	Transport	2.00	Market Charge	0.10
	Fertilizer	0.50	Purchase	12.00	Load/ unload	0.25	Transport	0.25
	Labour	2.25	Loss (8 percent)	0.96	Taxes	0.25	Damage/ others	0.25
	Others	0.25			Purchase	14.80	Purchase	20.74
	Loss (12 percent on FGP)	1.44			Loss (5 percent)	0.74	Loss (10)	2.07
	Total cost	**4.94**	**Total cost**	13.46	**Total cost**	18.04	**Total cost**	23.41
	Margin	*7.06*	*Margin*	*1.34*	*Margin*	*2.70*	*Margin*	*6.59*
	Farm Gate price (FGP)	**12.00**	**Local trader price**	14.80	**Wholesale price**	20.74	**Retail price**	30.00
Cucumber	Seed	0.50	Collection cost	0.50	Transport	2.00	Market Charge	0.10
	Fertilizer	0.25	Purchase	19.00	Load/ unload	0.25	Transport	0.25
	Labour	2.00	Loss (5 percent)	0.95	Taxes	0.25	Damage/ others	0.25
	Others	0.25			Purchase	22.49	Purchase	29.26
	Loss (10 percent on FGP)	1.90			Loss(2 percent)	0.45	Loss (5 percent)	1.46
	Total cost	**4.90**	**Total cost**	20.45	**Total cost**	25.44	**Total cost**	30.72
	Margin	*14.10*	*Margin(10 percent)*	*2.04*	*Margin*	*3.82*	*Margin*	*4.28*
	Farm Gate price (FGP)	**19.00**	**Local trader price**	22.49	**Wholesale price**	29.26	**Retail price**	35.00

Field Study, 2011

Annex 2: Imports of Vegetables from India to Biratnagar

Commodity	2008-09		2009-10	
	Quantity (kg)	Value (NPRs)	Quantity (kg)	Value (NPRs)
Onion	963,375	9,421,000	1,470,654	10,441,000
Tomato	225,709	2,136,000	82,155	545,000
Chili	395,014	14,865,000	226,212	13,019,000
Other green vegetables	681,568	7,910,000	1,382,205	15,659,000

Source: Custom Office Biratnagar, 2011

Annex 3: Export of Vegetables from Biratnagar to India

Commodity	2008-09		2009-10	
	Quantity (kg)	Value (NPRs)	Quantity (kg)	Value (NPRs)
Onion	575	143,000	0	0
Other green vegetables	493,000	2,323,000	45,000	194,000

Source: Custom Office Biratnagar, 2011

Annex 4: Imports of Vegetables from India to Bhairahawa

Commodity	2008-09		2009-10	
	Quantity (kg)	Value (NPRs)	Quantity (kg)	Value (NPRs)
Onion	34,569,129	353,878,000	44,915,199	443,432,000
Tomato	267,330	1,353,000	802,068	4,194,000
Chili	569,739	15,553,000	438,166	15,765,000
Other green vegetables	10,497,446	75,599,000	14,476,228	143,720,000

Source: Custom Office Bhairahawa, 2011

Annex 5: List of People and Places Visited

SN	Name	Designation	Address
1	Kanta Prasad Shah	Vegetable W/s	Gudary Vegetable Mandi, Biratnagar
2	Vijaya Gupta	Vegetable W/s	Gudary Vegetable Mandi, Biratnagar
3	Sital Kumar Barnawal	Vegetable W/s	Hat bazarline, Butwal-7
4	Shiva, Ramu	Vegetable retailer	Hat bazarline, Butwal-7
5	Nasib Ahamad	Vegetable W/S	Hat bazarline, Butwal-7
6	Gautam Agrahari	Vegetable W/S	Hat bazarline, Butwal-7; Ph: 9847036424
7	Murali Agrahari	Vegetable w/s	Hat bazar, shopping complex Butwal-7
8	Shakir Ali	Vegetable w/s and commission agent	Hat bazarline, Butwal-7
9	Kishor Man Shrestha	District Officer	DADO, Nepalganj
10	Sarada Gaywali	Technician	DADO, Nepalganj
11	Babu Kawadiya	Chlairman/Vegetable W/S	Rani Talau Sabji Mandi, Nepalganj
12	Rijwan Rai	Secretary	Rani Talu Sabji Mandi, Nepalganj
13	Md. Aamkra	Vegetable W/S	Aakram Tarkari Pasal, Nepalganj
14	Kesar Bungahadur Gurung	Secretary	Kalika Tarkari Samuha, Harre
15	Narendra Oli	Member	Kalika Tarkari Samuha, Harre
16	Lok Bahadur Oli	Member	Kalika Tarkari Samuha, Harre
17	Kul Bahadur Singh	Member	Kalika Tarkari Samuha, Harre
18	Susila Oli	Treasure	Kalika Tarkari Samuha, Harre
19	Jayaram Khatri	Farmer	Kalika Tarkari Samuha, Harre
20	Devendra Man Pradhan	Regional Chief	Trade and Export Promotion Centre, Surkhet
21	Mitra Raj Pyakurel	Officer	CCI, Surkhet
22	Prabal Sahi	Chairman	Babu and Sahi Sabji Mandi, Surkhet
23	Santi Sharma	Chairman	CCI, Dailekh
24	Lakchhman Shrestha	Immediate Past Chairman	CCI, Dailekh
25	Ganesh Khadka	Vice chairman	CCI, Dailekh
26	Dr. Hari Bahadur KC	District agriculture Officer	Dailekh
27	Shilpa Kuwar		Link Helvetas, Dailekh
28	Sarita Thapa		LILI, Helvetas, Dailekh
29	Govinda Pandit		Link Helvetas, Jajarkot Office
30	Shyam Deo Chaudhari		SSM-P, Helvetas
31	Ganga Bahadur Buda	Wholeseller	Ratanagla
32	Gobinda Nath Jogi	Himali Suppliers	Ratanagla
33	Tej Bahadur Ari	Chairman,	Agriculture market center Kapurkot
34	Prem Kumar Aacharya	Founder member	Agriculture market center, Kapurkot
35	Sovakar Sharma		Agriculture market center, Kapurkot

36	Churna Bahadur Gharti		Agriculture market center, Kapurkot
37	Bir Bahadur Rana		Vhirab Aaduwa Utpadak Sahakari, Batase, Palpa
38	Tula Bahadur Aadhikari	Chairman	Vhirab Aaduwa Utpadak Sahakari, Batase, Palpa
39	Bhuwan Bhatta	Regional Manager	NEAT, Butwal
40	Virendra Nath Upreti	Regional Manager	NEAT, Nepalganj
41	Durga Prasad Acharya	Marketing Specialist	NEAT, Kathmandu
42	Ganesh Chandra Dhakal	Plant quarantine officer	Sunaoul Bhairawa; Ph: 071-520371
43	Aamar Bahadur Malla	Computer operater	Custom office, Sunaul
44	Nabaraj Sharma		Gurase
45	Sangharsa Raj	Field mobilizer	NEAT, Kapurkot
46	Khagendra Mahato	Vegetable W/S	Agriculture produce market center, Birtamod
47	Mohan Siwakoti	Chairman	Agriculture produce market center, Birtamod
48	Arun Kumar Ghimire	Plant quarantine officer	Plant Quarantine Office, Kakarbhitta
49	Madan Kumar Bhattarai	Vegetable W/S	Charali wholesale market, Charali, Jhapa
50	Rudra Bhandari	Local trader	Shantinagar, Jhapa
51	Ram Bilas Panjiyar		Plant Quarantine Office, Biratnagar
52	Kedar Bahadur Shrestha	District officer	DADO, Morang
53	Som Adhikari	Executive Secretary	DCCI, Morang; Ph: 021-520712
54	Madan Khanal	Office Secretary	Origin of Certificate Office, Biratnagar Ph: 9842031900
55	Bijaya Gupta	Vegetable W/S	Biratnagar
56	Binod Regmi	Vegetable W/S	Bhanu Fruit and Vegetable Trade Market, Dharan
57	Kaji Giri	Chairman	Agriculture Product Market Center, Dharan
58	Purna Maya Gurung	District officer	DADO, Dhankuta; Ph: 9842354784
59	Jayendra Pradhan		DCCI, Dhankuta; Ph: 9842031849, 026-520099
60	Narayan Man Shrestha	Input supplier	Lumbini Agro Organic Fertilizer, Dhankuta; Ph; 026-520507
61	Punyawoti Shahi	Chairman	Shivalaya Women Multipurpose Cooperative Farmers Group; Nigale, Dhankuta,
62	Meghendra Gurung	Chief Market Manager	Sidhuwa Multipurpose Cooperative, Sidhuwa, Dhankuta; Ph: 9742000550
63	Durga Devi Shrestha		Womens group, Dhankuta; Ph: 9842061502
64	Rajendra Chandal		Jogbani Custom Office, Biratnagar; Ph: 9851106740
65	Gopal Prasad Shrestha	Director	Vegetable Development Division, Khumaltar; Ph: 01-5523701
66	Bhim Nath Sharma	Officer	DADO, Rupendhi; Ph: 9847023081
67	Durga Prasad Uprety	Agriculture Economist	Agriculture Commodity Export Promotion Program, Kathmandu; Ph: 9741150733
68	Badri Khanal	Agriculture Economist	Ministry of Agriculture, Kathmandu; Ph: 9841811355
69	Rewati Raman Poudel	Officer	DADO, Palpa; Ph: 9857060487

70	Ramesh Kumar Shrestha	Executive Director	Trade and Export Promotion Centre, Kathmandu; 01-5525898
71	Pradip Maharjan	CEO	Agro Enterprise Center, Kathmandu; Ph: 01-4262260
72	Pradhymna Pandey		WTO Section, MoAC, Kathmandu; Ph: 01-4211687, 9851125554
73	Hem Lal Devkota		MoAC, Singhadurbar, Kathmandu; Ph: 9841284508
74	Raju Ghimire	Extension Officer	Agriculture Extension Directorate, Kathmandu; Ph: 01-5524914, 5523602
75	Shyam Sundar Kundu	Major Vegetable W/S	Jaya Guru Bhandar, Mallaguri Regulated Market, Silguri
76	Samiron Chatarji	Head Assistant	Mallaguri Regulated Market Center, Siliguri; Ph: +977-9434026444
77	Mr. MK Rizab	Secretary	Mallaguri Regulated Market Center, Siliguri; Ph: +977-9434020688

Annex 6: List of PSDM Participants

SN	Name of participants	Organization	Address	Telephone
1	Prabhu Ram Khadka	Agriculture and Vegetable Market Center	Surkhet	9848050475
2	Ram Prasad Ghimire	Badcoup Vegetable Group	Palpa	9747001322
3	Bhishma P. Subedi	ANSAB	Kathmandu	9851044031
4	Gopal Prasad Sharma	Himalayan Naturals	Lalitpur	9851126196
5	Anantajibi Ghimire	NEAT Activity	Kathmandu	9741195574
6	Nabin Hada	USAID	Kathmandu	9801108803
7	Shailendra Shrestha	IDE Nepal	Butwal	9857022322
8	Menu K Shrestha	NEAT Activity	Palpa	9851115126
9	Dr Rohit Raj Chhetri	Butwal Chamber of Commerce Industry	Butwal	9857025738
10	Eak Pd Bhandari	Madan Pokhara Collection Center	Palpa	9847029128
11	Ganga Bdr Budha	Ganga Sabji Mandi	Surkhet	
12	Bhuwan Bhatta	NEAT Activity	Butwal	9841243955
13	Shiva P Neupane	NEAT Activity	Butwal	9841393539
14	Tara Prakash Shrestha	Tara Food Products	Butwal	9847154693
15	Badri Khanal	MOAC	Kathmandu	9841811355
16	Ganesh Chandra Dhakal	Regional Plant Quarantine Office	Rupandehi	9847281540
17	Kiran C Adhikary	ANSAB	Kathmandu	9851115672
18	Khadga Gurung	IDE Nepal	Butwal	071-437380
19	Bhim Nath Sharma	DADO, Rupendhi	Butwal	9847023081
20	Kabir R Sthapit	ANSAB	Kathmandu	9849275909
21	Rewati R Poudel	DADO, Palpa	Palpa	9857060487
22	Durga Pd Upreti	Agriculture Commodity Export Promotion Program	Lalitpur	9741150733

23	Suman Piya	Tata Food Products	Butwal	9847474712
24	Surendra	Trader	Butwal	9857025427
25	Gautam Amhari	Trader	Butwal	9847036424
26	Nasim Aahamed	Trader	Butwal	9847148286
27	Megh Nath Poudel	Trader	Butwal	9857022460
28	Ghanashyam Bhusal	Trader	Butwal	9857028121
29	Puspa L Ghimire	ANSAB	Kathmandu	9851051225
30	Edwin de Korte	NEAT Activity	Kathmandu	9849653635
31	B. B. Mathema	NEAT Activity	Kathmandu	9851108452

Annex 7: Major Production and Collection Pocket of Off-season Vegetable

District	Pockets
Surkhet	Harre, Gaddi Chaur
Dailekh	Seri Goganpani, Piladi, Jore banch, Dharam Pokhara
Salyan	Dhaniwang, Grarta, Rim, Chinwang, Thalwang, Tribeni, Siddeshwari, Chhayachhetra
Palpa	Madanpokhara/Nayapati, Dumre, Aaryabhanjyang, Bhairabsthan
Dhankuta	Parewadin, Murtidhunga, Hattikharka, Tankhuwa, Bhirgaun, Belahara, Pakhribash, Bhedetar
Ilam	Fikkal, Pashupatinagar, Ilam municipality, Sumbek, Shoyang, Shakhejung, Kolbung, Godak, Panchakanya, Chulachuli, Sangrumba

Annex 8: Cost Benefit Analysis of Off-Season Vegetables

Note: No = No immediate benefit; Low = Immediate benefits will be less than the initial costs; Medium = Benefits will be similar to the initial costs; High = Benefits exceeding costs

SN	Activity	Budget (USD)	Benefits			Remarks
			Year 1	Year 2	Beyond the project period	
A.	**Short-term Interventions**					
1	Introduce technological guidelines	18,000	Medium	High	High	Development of 6 manual ï one for each commodity
2	Introduce poly-house technology	70,000	Low	High	High	10 poly-house per district
3	Micro irrigation technology	18,000	Low	High	High	50 farmers per district with 50% subsidy in drip irrigation, rainwater harvesting tank
4	Training cum Exposure Visit	41,000	Low	Medium	High	2 visit to Himachal and Uttarakhanda (10days each)
5	Production training	100,000	Low	High	High	
6	Promote grading and collection centers	100,000	Medium	High	High	2 collection centre in each district
7	Entrepreneurship Development Training	70,000	Low	High	High	Combined with other crops
8	Support for plastic crates	28,000	Medium	High	High	
9	Establishment of off season vegetable call centre	25,000	Low	Medium	High	Establish in each district head quarter
10	Postharvest management training at collection center level	70,000	Medium	High	High	One training each district
11	Packaging & storage training	35,000	Medium	High	High	5 trainings
12	Support for Institutional Development of Cooperatives	80,000				Secretarial support, training
13	Publication and Publicity	30,000				Use of local FMs and newspapers

B.	**Long-term Interventions**					
1	Provision of crop insurance	50,000	No	Low	High	As demonstration
2	Development of off season vegetable blocks	50,000	No	Low	High	Social mobilization support
3	Development of hybrid varieties	50,000	No	No	High	Support to NARC
4	Verification/demonstration of different botanical pesticides	20,000	No	Medium	High	Support for NARC-Entomology Division
5	Establishment of cold storage	70,000	No	High	High	Feasibility study and support to private sector
6	Development of agriculture road	10,000	No	High	High	Collaboration support with DDC & VDC - Meeting, workshop support
7	Support to government for export promotion	20,000	Low	Low	High	Workshop, Meeting
8	Support for pesticide residue analysis	100,000	Low	Medium	High	In collaboration with Plant Quarantine, DFTQC for three centers